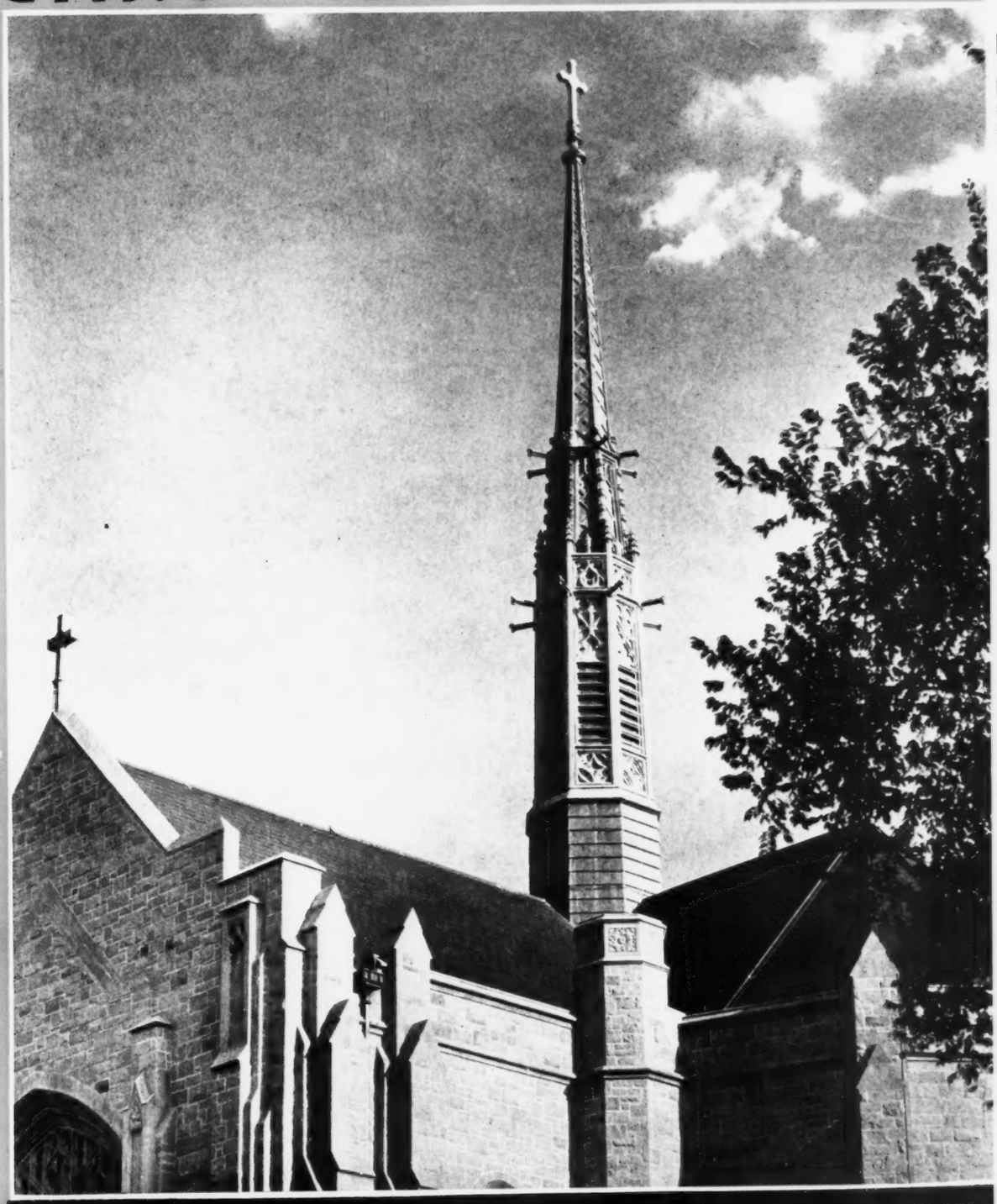
AMERICAN ARTISAN

WARM AIR HEATING • SHEET METAL CONTRACTING • AIR CONDITIONING



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RCH 28,
1932

Color and Modern Design in this Weather Control Unit will help you make more sales—and more profits . .

Your average home-owner knows lots more about heating today than he did five years ago. He expects the best for his money. He wants the latest advancements in efficient hot-air heating, plus modern design and color in the unit—at low price!

How are you meeting this demand? Ask the dealer who is installing MW "Weather Control" Units what his customers say about this Unit. It has the features that make sales these days. It has the price that literally lifts it away from competitive oil-burning, hot-air units. It has a long record of fuel saving for owners.

First of all, the MW "Weather Control" Unit requires no special wall ducts, but hooks right up to the present system in the home—reduces ducts in the basement. That simplifies installation, saves money for the home-owner. Secondly, when it begins to operate, your customer finds he is getting 5 gallons of oil to do the work of 8 gallons. Thirdly, this Unit doesn't stop with heating in Winter-time, but also circulates cooling air through the same ducts all Summer.

Here are new sales points to talk up! And, we have many records of successes by dealers who have backed up these arguments. The MW Unit is the "last word" in warm air heating. Its fuel efficiency is due to the fact that the oil-burner and the steel combustion chamber are designed as an integral unit. The MW "Weather Control" is listed as Standard by the Underwriters' Laboratories.

There are still a few openings available for dealers who are interested in tying up with the profitable

MW FRANCHISE PLAN

Write for particulars.

MW Boiler Unit

This MW Oil-Burning All-Steel Boiler Unit—for hot water or steam heat—is amazingly efficient because it's a *matched* unit. Both the boiler and the burner are designed to operate together. Thermostatically controlled and extremely quiet. Listed as Standard by Underwriters' Laboratories.

MW Water Heater

The MW Oil-Burning Water Heater gives an inexhaustible supply of hot water at a heating cost of only 1/20th of a cent a gallon. This MW Oil-Burning Water Heater is automatic and Thermostatically controlled. And it's noiseless, with not a single moving part. Listed as Standard by the Underwriters' Laboratories.

MW WEATHER CONTROL

(manufactured by MOTOR WHEEL CORPORATION, Heater Division, Lansing, Michigan)

STEP ON IT

Let us send you a sample Barnes Elbow for your personal test of rigidity. "STEP ON IT". You will find our claims of superiority very conservative.

Sheet Metal Men everywhere have learned the Barnes Elbow story. Have you? It is well worth while.

You will find all Barnes Products offer unvarying quality.

Make this free test and then "STEP ON IT" for your jobber will likewise "STEP ON IT" when orders specify

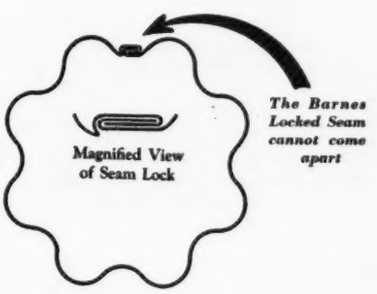
Barnes

Cash in on the Barnes line. It is a genuine asset to the business growth of every sheet metal contractor....

The "Barnes" Super Elbow

HEAVIER—STRONGER

...yet cost no more



Stand on one and test its strength

BARNES METAL PRODUCTS COMPANY

4425 West 16th Street CHICAGO, ILLINOIS

Manufacturers of Conductor Pipe, Elbows, Eaves Trough and Fittings • All Sizes • All Metals

Covering All Activities
IN
Gravity Warm Air Heating
Forced Warm Air Heating
Sheet Metal Contracting
Air Conditioning
Merchandising
Ventilating

AMERICAN ARTISAN

Founded 1880

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Bids that *bring* business

Instruct your salesmen to always mention the familiar Armco triangle and what it stands for: *twenty-seven years of rust-resisting, low-cost service.*


INGOT IRON SHOP NEWS

SELLING ONLY TO "GOOD PAY" CUSTOMERS IS A VERY IMPORTANT AID TO PROFITS

Check Your Prospect's Credit Rating Before You Sell Him

Metal Plays Major Part in the Meat Packing Business

Shop Gets New Business Through Newspaper Ads

H. E. HICKMAN TAKES BY DEATH

BETTER SELLING

Read "Ingot Iron Shop News" every month for ideas and suggestions on how to stimulate sales, cut costs, and turn out better work. Published by the Armco Distributors Association, this valuable business-building paper is free to anyone concerned with metal work. Write us if you want to get it regularly.

A QUOTATION should be more than a skeleton price statement if you would improve your chances of clinching the job.

Every bid should include an outline of how you intend to do the work, of the materials you plan to use, as well as the gage, type of joints, name of paint, and other important information the buyer should know.

This gives the prospect an opportunity to see in writing just what your price includes. Moreover it suggests that he insist on a similar break-down of the cheaper bids. After comparing the various bids, he will probably question the lowest price being the most economical and ask you how the use of quality materials with quality work saves money.

This method of submitting quotations has increased considerably the business of many contractors. Perhaps it will also help you get more profitable jobs. Give it a trial.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio

Distributors in the principal cities of the United States and Canada

PROFITS COME WITH BETTER SELLING

ARMCO PRODUCTS

Help you sell

ARMCO . . . ON THE AIR . . . WLW . . . MONDAY NIGHTS . . . 9:00—9:30 E. S. T.

THEIR Confidence was Justified

WHEN 169 RAILROADS FAILED IN 1893 JOHN H. PATTERSON SAID:

"The year has been unparalleled in the history of the United States. Great questions were to be solved, every industry was stagnant. Some closed down, some lost courage, while a few pushed ahead and worked harder than ever with confidence in the future. We did not let the hard times interfere with our work. When times got duller, we advertised the more and worked the harder."

WHEN PIG IRON DROPPED 50% IN 1907, ANDREW CARNEGIE DECLARED:

"This panic will soon run its course and pass away leaving no impediment to the return, in due season, of another period of wholesome, because needed, expansion of our resources....

"We have had the greatest expansion of modern times. Reaction had to come—will prove healthful. Nothing can stay the rapid progress of the Republic. She is all right."

WHEN DEEP, DARK GLOOM RULED IN 1921, THOMAS FORTUNE RYAN SAID:

"Our merchants have been buying only what they can sell quickly for cash. The consumer has had to listen to so much pessimistic talk that he buys only what is absolutely necessary. People everywhere have been scared. They are getting over that.

"Our people are the greatest consumers of food and manufactured articles in the world in normal times—and normal times are coming back. . . ."

AMERICA CAME THROUGH!

In 1893 stark ruin stalked through the land. 467 banks failed in a few months. Mills, furnaces and factories shut down everywhere. Bankruptcy was on every hand. America had twice as many unemployed per thousand population as she has today. But she put them all back to work.

In 1907 panic broke loose. The production of pig iron dropped 50% in less than a year. All but the strongest men lost heart—"We are ruined," they declared, "recovery cannot come in our time." Yet in two years prosperity had returned.

In 1921, when many honest and thoughtful people were predicting worse conditions, the country was already beginning to climb to the greatest era of prosperity it had ever experienced.

History tells how America has fought and won 19 major depressions. Good times always follow hard times, as surely as day follows night. Prosperity always comes back. It is coming back *this* time, too.

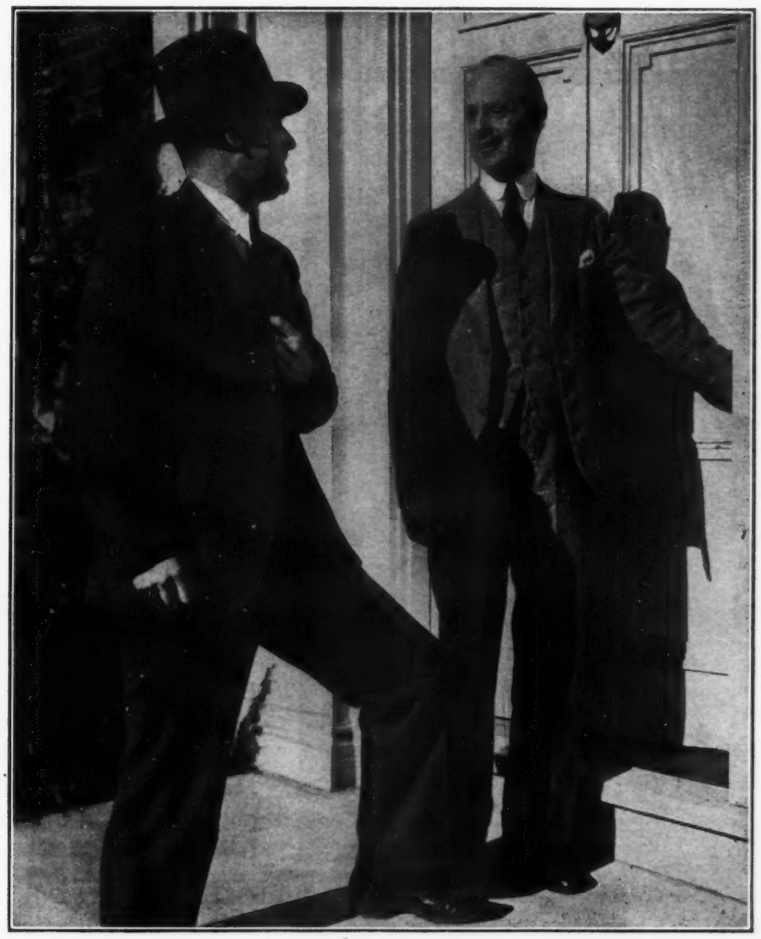
Above all things, let us have faith.

America Has Beaten 19 Major Depressions
She will Beat this one

THE NATIONAL PUBLISHERS ASSOCIATION

"As the most nearly self-contained nation, we have within our own boundaries the elemental factors for recovery."

(From the Recommendations of the Committee on Unemployment Plans and Suggestions of the President's Organization on Unemployment Relief.)



ANACONDA
from mine to consumer
REG. U.S. PAT. OFF.

"and . . . I got the job"

"He told me he wanted sheet metal that would not rust. When I suggested Anaconda Copper, he said, 'That's the kind' . . . and I got the job."

To builders and home-owners everywhere, the name "Anaconda" means dependable quality . . . quality safeguarded throughout manufacture . . . quality which in turn is reflected in the dependable service given by Anaconda Copper in thousands of installations. Leading sheet metal supply houses carry Anaconda Copper in sheets, rolls, and Economy strips, and copper gutters, leaders, elbows and shoes trade-marked Anaconda. The American Brass Company, General Offices: Waterbury, Conn.

ANACONDA COPPER

ARE YOU "FREE WHEELING"?

"Free Wheeling" may be a great improvement in automobiles—but it's a bad thing for Business.

"Free Wheeling" is just "coasting along"—either going steadily down hill or steadily losing momentum—and the more momentum lost, the greater will be the demand for power—drive—energy—SELLING—to gain back the loss.

The time has come for all American Business to quit "Free Wheeling"—for we must admit that a good many businesses, both big and little, have been "coasting along" too long.

Business and the Government have joined hands to put millions of dollars back to work—and some of them will come out of hiding and be put to work in YOUR territory. Many will go into home building and remodeling—not only because every dollar, so spent, buys a greater value today, but also because it is most safely invested.

Of course, there will be no war-time flood of it—but if you will keep on the job—keep your eyes open—keep your foot on the gas of SELLING, you will more quickly feel that you are "getting in on" the revival that is already being definitely sensed in many sections.

And in this Great "Golden Year of the WEIR"

during which we are celebrating the 50th Anniversary of the WEIR, we are offering our dealers not only the most complete line for all classes of Air Conditioning and Heating, but a wealth of selling helps that will, if properly used, be genuinely helpful in making 1932 a year of progress and profit.

An inquiry will not obligate you, but will bring you facts that may mean much in the future of your business.

THE MEYER FURNACE COMPANY
PEORIA, ILLINOIS

Pioneers In The Steel Furnace Industry

AMERICAN ARTISAN

VOLUME 101 NUMBER 7

WARM AIR HEATING • SHEET METAL CONTRACTING • AIR CONDITIONING

How Long Can We "Sit Tight?"

ONLY a few days ago we visited the shop of one of the largest sheet metal contractors in the middle west. This organization in its hey day employed as many as fifty men full time in the shop and usually had from 50 to 100 men out in the field.

For the last ten months this firm has seldom had more than two men in the shop and no men in the field. So far as exterior appearance is concerned this organization is "sitting tight" and waiting for something to happen.

Not more than three weeks ago we visited the shop of a heating contractor who frankly said that his business has gone to pieces. In place of the twelve men he had busy all the time in 1930 he is now doing all the work himself and hiring men only when he has castings to lift. This man, also, is "sitting tight."

These two cases can be multiplied by hundreds, and is undoubtedly typical of towns of all sizes in all parts of the country.

Which brings us to the question—"How long can we continue to 'sit tight?'"

If we could suggest the solution for our industries we would, at the same time, be giving the whole country the panacea which it is waiting for. We hasten to state that we have no such suggestion. •

Nevertheless, the question still confronts us. If we make up our minds that no sudden upheaval is going to bring back good business conditions, then we automatically adjust our thinking to the task of working out small plans, call them schemes if you want to, which individually seem pretty trivial, but which bulked together bring orders into our shop, give pay envelopes to the men we once employed, give dollars to spend to people willing to buy if they have the money—in short, start business on the road back.

Perhaps this idea can be stated more clearly in the words of a contractor who thinks straight to the point. This man said: "For fifteen years our shop found most of its business in roofing. By one scheme or another we managed to hold our volume in spite of inroads by cut-priced operators.

"When architectural sheet metal began to find favor just before the depression we actively solicited work in this field. We called on the architects, we built up our fences with the general contractors, we organized our working force and our shop operations so that we were getting the most for our labor and overhead dollar. What happened to architectural sheet metal when new construction fell off we all know.

"We had, at the end of this period, spent twenty years building up a business for which there was no market. The easiest thing we could have done was to close down and sit tight. But, I can say without boasting, neither my partner nor I ever want to sit tight. We have always believed that business goes to the man who gets out after it, and we still feel the same way.

"You may be surprised to know that in spite of the depression and our ages, we are now driving wedges into a new field—the field of domestic air conditioning. We don't know a whole lot about it, but we can sell and we can get the help and information we need from others. The going is slow. Many people haven't the money to buy, but we are making a sale here and there. Sometimes we get discouraged, especially when we work for weeks on a prospect and then lose the sale.

"But we console ourselves with the thought—if we don't do this what can we do but close up. We have not abandoned our other business. Just this week we received an order for some metal trays that five years ago we would have laughed out of the shop. Today we will take anything—because we are convinced that only by bulking small orders can we continue to exist. And we are not discouraged."

We think this contractor's philosophy is commendable. He refuses to sit tight, but more important, he has convinced himself that "big" business as he once knew it is out of the picture for the present and that only by being satisfied to pick up crumbs can he keep his shop operating. Unquestionably with his perseverance and ability his air conditioning business will build up as the months go by.

And when he is again enjoying profits, others in his town will still be "sitting tight."

The Owner of This Home Wanted the

"Best Heating Plant He Could Buy"

So Badly That He Willingly Traveled 65 Miles From Home in Order to See a Modern Warm Air Heating System

THAT the dead set buyer of steam or hot water heating may turn out to be a most enthusiastic owner of air conditioning systems, is an idea which was recently proved in Lansing, Michigan, when the owner of a new $25,000 home purchased warm air after visiting several installations and seeing for himself just what advantages this modern way of heating has to offer.

The installation is in the home of Mr. F. A. Stolte, official in the Reo Motor Car Company. Mr. Stolte has been Superintendent of Building Construction for the Reo company for many years and in this capacity felt he had all the information available about domestic heating systems.

It was natural, then, that when he came to build his new home his first thought should have been for steam or hot water for he had long dealt with these types of heating systems but had had little or no experience with warm air as we install it today.

Mr. Stolte was, however, anxious to have in his new home the best type of heating system on the market and was, as he said, "Only going to build one home in my lifetime and I believe the heating plant is the most important piece of equipment going into my house."

Owner Wants to See

As a result of this desire to see and buy the best, he proved willing to go as far afield as Ann Arbor, 65 miles away, to investigate and actually see warm air heating systems described to him as strictly modern. That he was convinced that warm air had the most to offer in the way of comfort, convenience and health is evinced by the fact that his new home has a modern conditioning system.

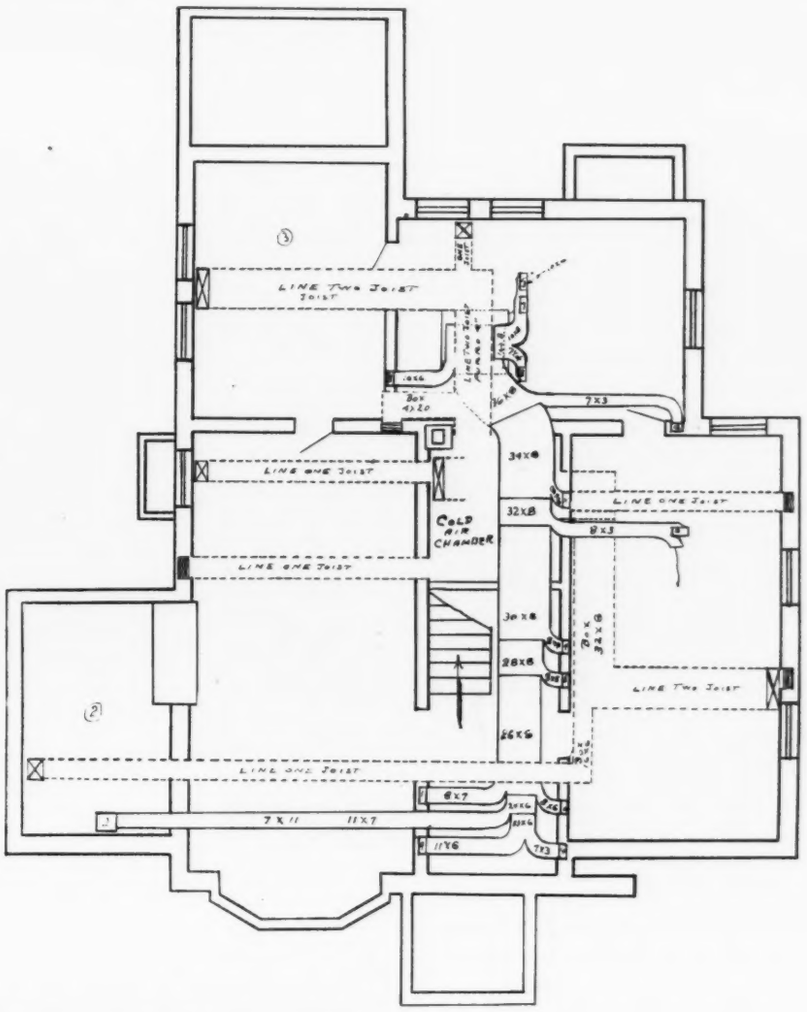
The system designed for his home and now operating is built around one of the newer types of unit heating plants, in this case a Lansing Dailaire unit furnished complete with blowers mounted in the top of the casing, washers in the sides, and fired with an oil

burner. A feature of the installation is the compactness and attractive appearance of the completed system.

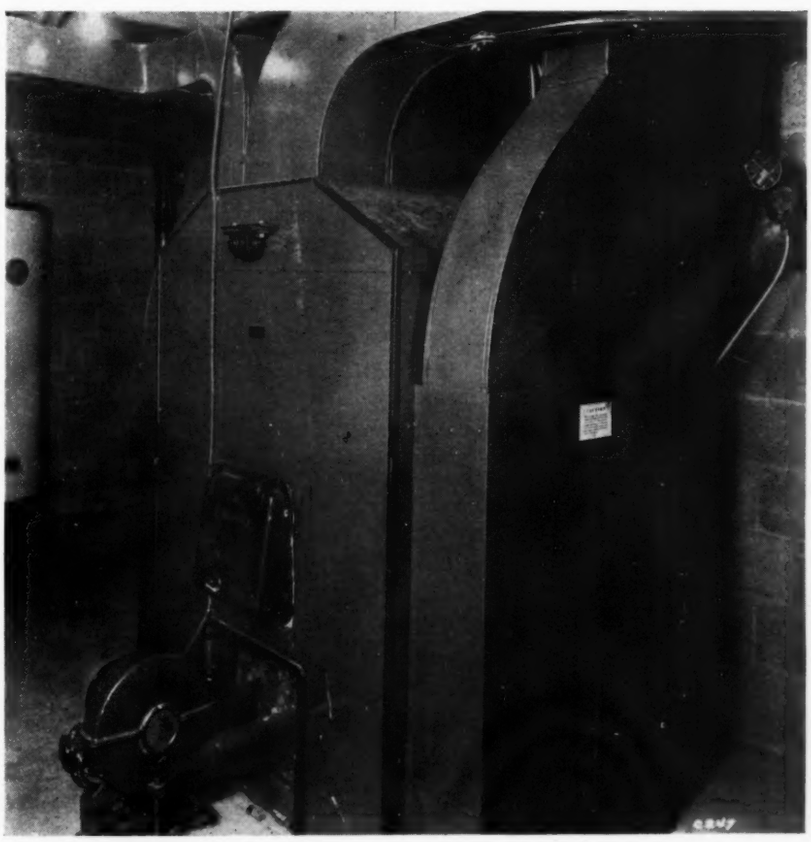
The house in which the installation is made is, as shown in the exterior view, of brick, with comparatively small glass areas on most of the walls, but with an extensive roof area and at least four sets of large windows. The floor plan shown does not designate the rooms of the first floor, but these can be picked out as living room, dining room, bedroom, sun porch, kitchen, hall, bath and a breakfast room. On the second floor there are three main bedrooms, one maids' room and two baths. The total cubage of the house is above 17,500 feet.

System Design

The floor plan also shows the arrangement of the heating plant and illustrates the general compactness of the piping system which serves



At the right is the piping layout of the system. Only forced air heating could give the owner the basement space, free floor areas and modern heating he was so determined to possess



To the left is the heating plant. It is a Dailaire, oil burning furnace with humidifiers in the return system, blowers for circulation, rectangular ducts for head room, and full automatic control for convenience

so many rooms. On the warm side there is one main duct, very long, running from the rear to the front, then across the front to the sun room and one small, short two-branch leader off the top of the heater.

In designing the system the heat loss was arrived at by using the B.t.u. method of figuring. The data sheet prepared for the job shows that the following coefficients of heat transmission were used: Wall, brick veneer, .133; ceiling, .155; glass (single), 1.13; leakage around windows (weatherstripped), .42.

In preparing the data sheet the inlet temperature was established at 120 degrees to give a temperature

A feature of the system is the use of a "cold" room into which most of the return air is concentrated. Use of this room eliminated much duct work at the furnace and still takes up none of the usable basement space. The warm air duct shows the type of supply system, dampers at the branches, and stiffening seams at section joints

rise of 55 degrees. The c.f.m.; was then derived from the formula—

$$\text{c.f.m.} = \frac{\text{B.t.u. loss} \times 55}{55 \times 60}$$

The temperature selected for all rooms was 70 degrees with an exposure loss of an additional 10 per cent. The static pressure for the system was established as .07 by taking the longest run (the one to the sun room), adding the equivalent of 10 diameters of round pipe for the one 90-degree elbow. By using the friction chart, the c.f.m. for each room was carried across the chart to the .07 friction line to determine the velocity per minute for each branch.

On the cold side of the heater there is an interesting feature—the cold air room located under the basement stairs. As shown in the plan all the return airs but the one from the two rear rooms of the house are brought to this cold room which is separated from the heater by a tile wall. Only the fan discharge is cut through this wall.

As shown in the photograph of the furnace the return from the rear of the house is hooked into the casing with the vertical box in the bottom of which there is a spray nozzle discharging water against the air flow into the casing.

Through the use of careful engineering, this system has passed through the fluctuating weather conditions of the past winter to the entire satisfaction of the owner.

Uses Data Sheet

The contractor reports that in presenting his sales talk he emphasized the carefully engineered plan which had been prepared and showed Mr. Stolte the data sheet on which every item had been fully considered and accounted for. The plan and data sheet were instrumental, he reports, in interesting Mr. Stolte.

The heating contractor who installed this interesting forced air plant is E. H. Ward of Lansing. The design of the system was prepared by the engineering department of the furnace manufacturer.

TABLE #1 SEE NOTE G — PERIMETER CE BASED ON 1/16 CRACK-IN B.T.U. PER HR.-PER LIN. FT. PER 1° RISE

Type of Window or Door	5 M. Wind	10 M. Wind	15 M. Wind	20 M. Wind	30 M. Wind
Around Uncalked Frame	0.19	0.21	0.41	0.57	0.98
Double Hung Wood Sash-No Strip	0.72	1.54	2.25	3.00	4.24
Average Without Weather Strip	0.06	0.21	0.42	0.64	1.08
Double Hung Metal Sash No Strip	0.36	0.84	1.35	1.90	3.10
Same With Weather Strip	0.11	0.35	0.58	0.83	1.40

TABLE #2 SEE NOTE H — VELOCITIES RECOMENDED FOR SUGGESTED TEMP.

Building	Horiz. Duct	Riser		Ret. Reg.	Ret. Riser	Ret. Duct	Reg. Temp.
Residence	3 to 700	3 to 500	1 to 300	1 to 300	3 to 500	3 to 500	110°-140°
Schools	8-1000	5-600	3-400	3-400	5-600	6-800	[illegible]-120°
Church	7-900	4-600	3-500	3-500	4-600	5-700	[illegible]-120°
Auditorium	8-1000	5-600	3-500	3-500	5-600	6-800	[illegible]-120°
Factory	10-1400	8-1000	4-1000	4-600	6-1000	8-1200	[illegible]-140°

TABLE #3 SEE NOTE F — FACTORS THAT MAY BE USED TO FIND C.F.M. WITH 70° ROOM TEMP.

Inlet Temp.	Outlet Temp.	Temp. Rise	Factor
140°	65°	75°	.0122
135°	65°	70°	.013
130°	65°	65°	.014
125°	65°	60°	.0153
120°	65°	55°	.0167

SYMBOLS

C.C. Coefficients
C.F.M. Cubic Ft. Per Min
V.F.M. Velocity
S.P. Static Pressure
T' Register Temp.
T² Room Temp.
RT Return Air Temp.
TR Temperature Rise

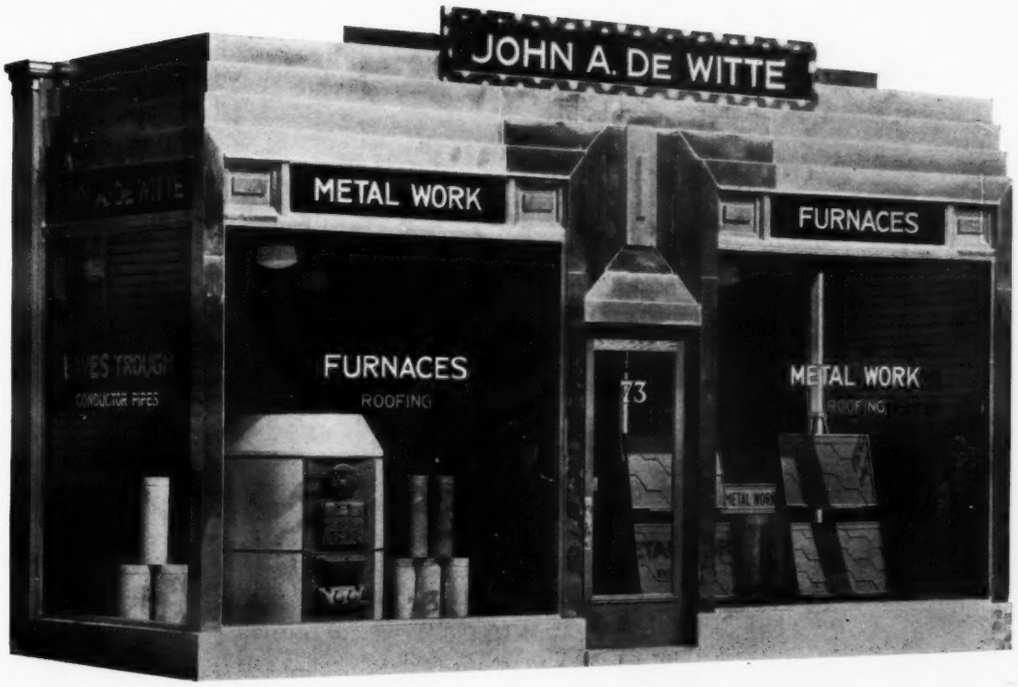
Exposure Factors	Construction	C.E.	
N 15% S ✓	Wall-Brick Veneer-Insulated	.133	Type of Building RESIDENCE
NW 15% SW 10%	Ceiling L&P-Floor- "	.156	Owner Mr and Mrs F. A. Stolte Address Lansing Michigan
NE 15% SE 10%	Floor	✓	Architect Hager Cove Lumber Co.
E 10% W 10%	Glass Single	1.13	Heating Contractor E. H. Ward & Co
Windows Per Hr 15 Outside Temp -0	Perimeter D.H. Windows-Strips	.42	Manf of Heating Unit Dail Steel Products Co
			Heating Engineer H. E. Huffaker

Engineering Data For # 50 — Sheet # 1 — Date 5/9/31

Be Sure To Account For Each Item On This List Either By Figures Or (✓) Check.

Item	Room No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Room Use	Living	Sun	Dining	Hall	Bed	Bath	Kitchen	Nook	Bed	Bed	Maid	Bath	Bed	Bath	
	1st. 2nd 3rd Floor or Basement	First	Do	Do	Do	Do	Do	Do	Do	Second	Do	Do	Do	Do	Do	Totals
1	Size	[illegible]	[illegible]	15/12/8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11/13/8	9/13/8	7½/6/8	[illegible]	8/7/8	
2	Cubic Feet	3391	1256	1530	1462	1683	425	867	765	2408	1144	936	360	1296	448	17571
3	Sq Ft Floor	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	" " Ceiling	✓	✓	✓	✓	✓	✓	✓	✓	301	143	117	45	162	56	
5	" " Roof	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
6	Lin. Ft. Perimeter	75	122	95	20	53	18	53	39	70	35	35	16	35	12	
7	Exposure Direction	E	E-W-S	S-W	✓	E-N	N-W	N-W	W	E-S	E-N	N-W	N	W	E	
8	Register Temp (T')	120°	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	
9	Mean Temp	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
10	Room Temp (T²)	70°	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	
11	Outside Wall-Gross Area	204	280	229	36	153	127	178	64	248	192	120	60	208	56	
12	Glass and Doors	59	97	70	21	36	12	16	24	48	24	24	9	56	10	
13	Outside Wall-Net Area	145	183	159	15	117	115	162	40	200	168	96	51	152	46	
	Heat Loss B.T.U. Per Hr - Note I															
14	Outside Wall	19.3	24.3	21.1	20.0	15.6	17.8	25.1	6.2	26.6	22.3	12.8	6.9	20.1	6.1	
15	Glass and Doors	66.7	109.6	79.1	23.7	40.7	13.6	18.1	27.1	54.2	27.1	27.1	10.2	62.3	11.3	
16	Ceiling	✓	23.3	✓	✓	✓	✓	✓	✓	46.7	22.2	18.1	7.0	25.1	10.2	
17	Floor	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
18	Roof	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
19	Perimeter	30.5	51.2	39.9	8.4	22.3	7.6	22.3	16.4	29.4	14.7	14.7	6.3	14.7	5.0	
20	Sub Total	116.5	208.4	140.1	52.1	78.6	39.0	65.5	49.5	156.9	86.3	72.7	30.4	122.2	32.6	
21	Exposure Allowance	11.6	20.8	14.1	✓	11.7	5.8	9.8	4.9	15.6	12.9	10.8	4.5	12.2	3.2	
22	Net Loss for 1° Rise in Temp	128.1	229.2	154.2	52.1	90.3	44.8	75.3	54.4	172.5	99.2	83.5	34.9	134.4	35.8	
23	" " " Room Temp (T²)	8967	16044	10794	3647	6321	3136	5271	3808	12075	6944	6545	2443	9408	2506	97909
24	Cubic Ft Per Min (CFM) Note F	161	268	179	60	105	50	88	63	201	116	109	41	157	42	1630
25	Static Pressure (SP) Note L	.07	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	Do	
26	Velocity Per Min (VFM) Note L	450	550	470	350	420	330	400	350	500	430	420	300	450	300	
27	Size of Branches & Stacks Note L		See	Blue	Print											
28	Register Size - Make ( )		"	"	"											

This is the data sheet prepared for the job. Every contingency is accounted for in its proper place. This sheet was shown the owner and proved valuable in selling the installation



John A. DeWitte Says—

Take Your Shop Out of the Basement

FIFTEEN years ago John A. De Witte of Rochester, N. Y., was advised by his father to get his metal and furnace shop "out of the cellar."

"You'll never get anywhere in business until you have a shop that commands public confidence and respect," the elder De Witte warned.

"That," declares John De Witte, "was the best advice I ever received and started me along the road to business prosperity." Just recently De Witte opened his new shop at 73 Webster Avenue which if not the largest is certainly one of the most attractive in the city. It climaxes the steady rise of John De Witte from a one-man cellar furnace shop to a modern purveyor of furnaces and metal work.

The new shop, located almost directly across the street from the premises De Witte occupied for nearly 17 years, has proved conclusively the value of having a "good front." The attractive display room is clean and cheerful with brightly finished walls and modern electric fixtures. It is such a room as one might expect to find in a high class radio or automobile dealer's establishment. The exterior is finished in Allegheny Metal and provides a most attractive framework for the large plate glass display windows.

Since opening the new shop, De Witte's repair work has increased 50 per cent, a fact which he attributes almost entirely to the sales pulling power of his attractive establishment.

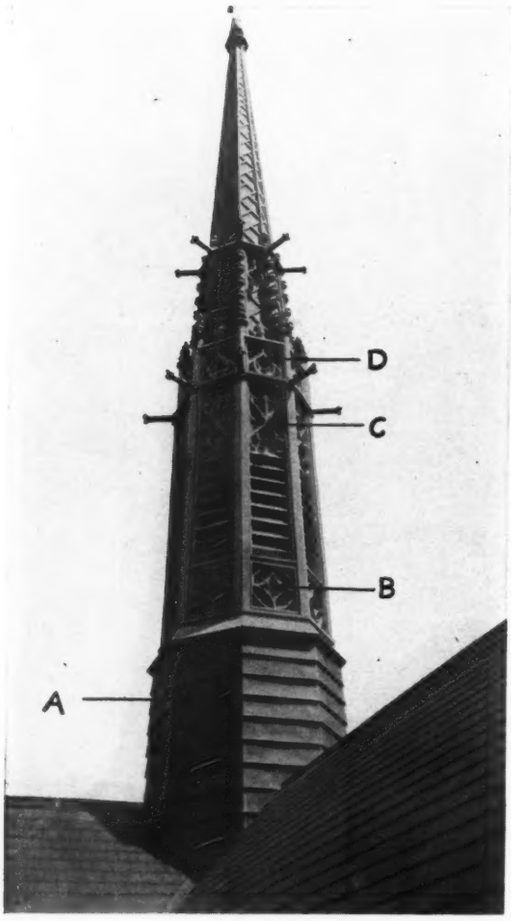
"Too many metal and furnace shops," he says, "fail to appreciate the value of proper merchandising. Their shops are untidy, unattractive, and frequently located in basements or in the rear of some building. When I started my business I followed this usual custom and opened my shop in a basement. At the end of two years I was right where I started. It was then that my father gave me the advice which has proved so beneficial. Good work is necessary to hold business but in order to get it you must make a good first impression on the prospective customer."

De Witte's success is ample proof of the value of his policies. At present he maintains a force of 14 men and manages to keep them busy every day on furnace installations and repair work. Last year in spite of business he sold three carloads of furnaces.

De Witte specializes on residential work. He takes no commercial work, explaining it in this way:

"We have built up our reputation on residential work and know it from A to Z. We cannot compete with some of the larger contractors on big commercial jobs because their forces are more familiar with that type of work. But we defy any one in the city to beat us at our own game, the residence.

De Witte has found that in merchandising furnaces a knowledge of heating with regard to its effect on health opens up new avenues of approach to customers. In fact instead of just selling a new furnace he sells health and comfort.



The fleche on St. Catherine's church is an outstanding piece of sheet metal craftsmanship. Most of the enrichment was fabricated in the contractor's shop

1931's Outstanding Fleche

IN the field of sheet metal work for churches, the Gothic type of architecture in which the dominating ornamentation is the fleche is always interesting because the fabrication and erection problems connected with the slender spire call for ingenuity and skill on the part of the contractor.

A particularly good example of fleche construction was recently completed on St. Catherine of Siena Church, Chicago. Typical of Gothic architecture, the exterior of the building is decidedly plain, depending for ornamentation on the handling of the buttresses and the stone tracery at the windows. On St. Catherine's Church the lead coated copper fleche, with its delicate paneling, louvres, and diagonally ribbed spire, is the outstanding feature.

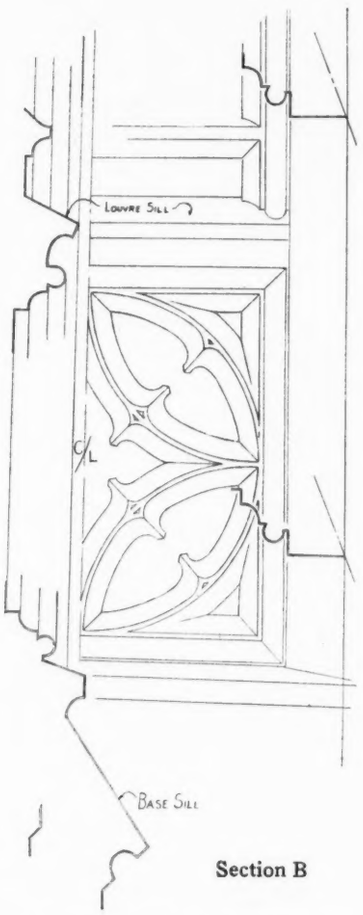
The design of the church and of the fleche is the work of Mr. Joe W. McCarthy, Chicago architect. Sheet metal work was done by the James F. Mansfield & Son Company of Chicago.

Probably the most interesting feature of the metal contract is the fact that aside from such ornaments as the ends of the gargoyles, the buttress finials and some sections of the cross, all the work was fabricated in the Mansfield shop. An idea of the amount of detailed design and intricate hand fabrication necessary can be obtained from the photograph of the fleche.

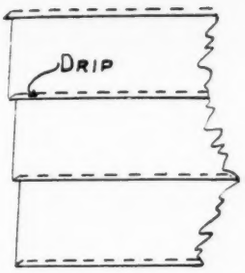
Fleche Base

The fleche meets the roof through an eight sided base covered in lead coated copper. The design of the base is such that the finished appearance resembles wide siding. One of the details shows how the base sections were fabricated. Wide sheets were cut to the width of a base side. The sheet was formed to give the projecting bottom which is also a drip. Ends were cut in mitre with a seam turned into the back and soldered. The sheets were wide enough in the flat so that three siding formations were made in each sheet.

The base is carried down into the valleys between the crossing of the ridges. These sections were cut to fit and are underlaid by high flash-



This profile and plan shows the construction of the ornamental panels below the louvre sections



DETAIL OF BASE SIDING

Section A
The base siding was formed in wide sheets, mitred at the ends, with three siding formations made in the width of the sheet

ing which comes out from under the slate.

The sill which separates the base section from the enriched panels and louvres above is formed in the usual manner and seamed to the base and the panels. There are two sections in this sill—the lower sheet turned into a drip above the base and the top section forming the base for the panels.

Panels

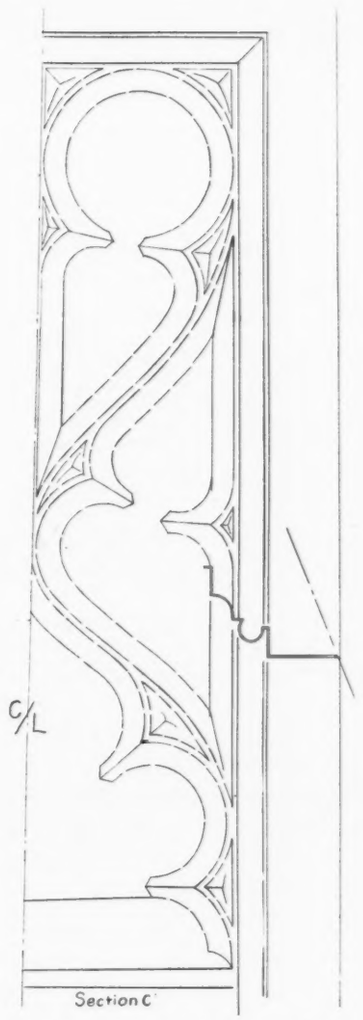
Details show the formation of the enrichment on the panels below the louvres. These panels were formed on a flat back sheet with the design of the cross in the circle made up by hand in sections and soldered to the back. These panels reach from hip to hip and were made as complete sections ready for erection.

The louvre sections are of customary construction with the vanes carried up behind and turned into a rolled edge. A copper screen is fastened to the back of the louvre section. The sill of the louvre section forms the top bar for the panels below.

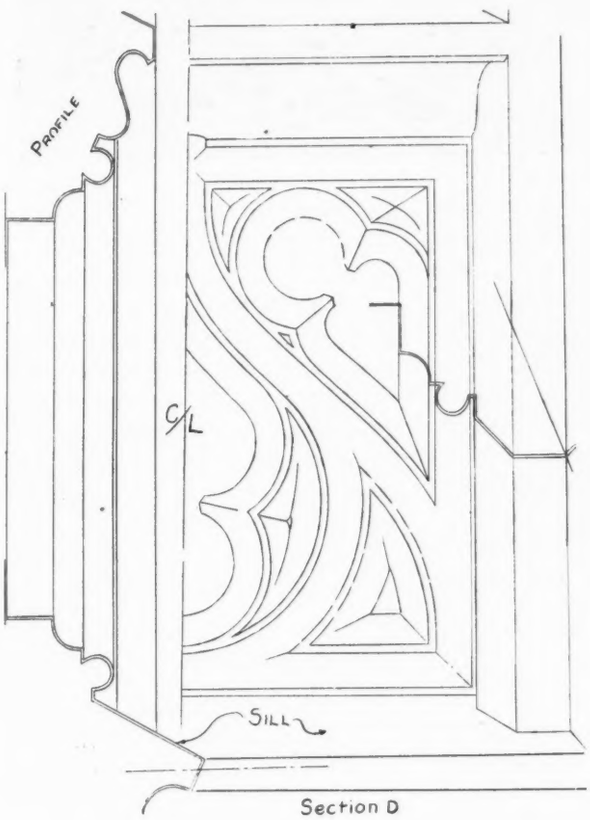
Above the louvres there is a second band of panels, with a somewhat different design. These panels were fabricated similarly to the lower band. At this elevation the pitch in of the spire becomes more pronounced so that there is considerable more taper to these panels. A detail shows the formation of the tracery and gives a clear idea of the pattern work necessary to build up the sections ready for application to the back sheet.

In preparing these panels, the company prepared full sized details and took off the necessary punch marks directly to the metal.

There is another, or third, band of panels above the gargoyles. The design here is different again from the lower two, but the same method of handling was followed.



Section C is a half plan of the panels above the louvre. The design was taken off full scale sheets and assembled in the shop



This profile and plan is for sections just below the buttress finials. The intricate design was fabricated in small sections, soldered to a back-up sheet, and assembled as complete panels ready for erection. Full scale drawings were used for transfer to the metal

The louvre and panel sections are separated by hips which are really buttresses. A cross section of one of these hips shows a roughly ten sided figure with two plain front faces followed by a fluted face and a complete enclosure at the back. These hips are erected on wood blocking.

The top ends of these hips is enriched with tall finials supplied as stampings which were received as complete units for erection on the hips.

Gargoyles

There are two bands of gargoyles on the fleche. While these resemble crockets they do not serve as water drips. The outside end of these sec-

On the school building there are several dormers along each side. Siding and roof sheets were cut and given preliminary seaming in the shop, leaving only clipping and final seaming to be done on the job

tions and the inside end where the ornament fastens to the fleche are stamped sections. The middle section which is of plain fabrication was made in the shop.

The inner end stamping on the lower band of gargoyles is not very large, but the highest band has pronounced stampings which are visible from the ground.

Spire

Above the buttresses there is the two-section spire, with enriched hips in the lower section and plain hips above. Between these hips there are diagonally ribbed panels made up on flat back sheets. The ribs are all shop formed and hand applied, soldered to the back sheet.

The spire panels were made in 8-foot sections with soldered, lock joints. Each section carries two halves of the hip. One half is rounded and turned under to lock and the other edge is a standing seam for locking. The tower is structural iron frame with wood sheathing over all faces. Suitable blocking was ordered by the metal contractor and applied by the carpenters.

The ornamentations on the lower hips are stampings.

The framework of the fleche terminates just below the base of the cross. A reinforcing pipe extends through the end into the cross. Every section of the cross, excepting the ball, was made in the Mansfield shop. All metal on the cross is tinned for the application of gold leaf. The fleche lightning rod enters the spire at the ball.

Decks and Gutters

One of the interesting applications of copper on the church is found in the extremely wide gutters and flat decks. Around the rear of the sanctuary and the two ends of the transept the gutters vary from a width of perhaps two feet to widths of ten feet. These gutters are pitched with the roof, giving a wide gutter against the coping and a slope to a point where the gutter joins the roof.

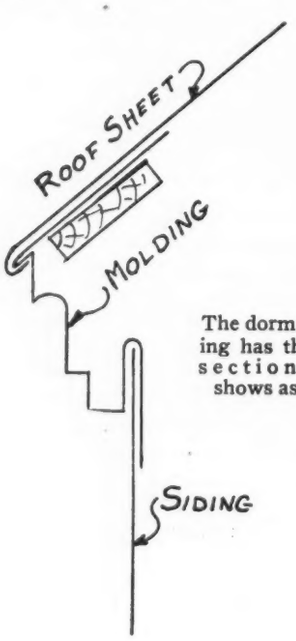
All these gutters are sheathed in copper. As shown in one of the details, the gutter flashing is an extremely wide sheet which is caulked into the masonry below the cap, continues down the back face of the wall, across the gutter and becomes a part of the deck. Single lock joints were used in these gutters, with every seam soldered.

The same construction is used on the flat decks which roof the two sacristies.

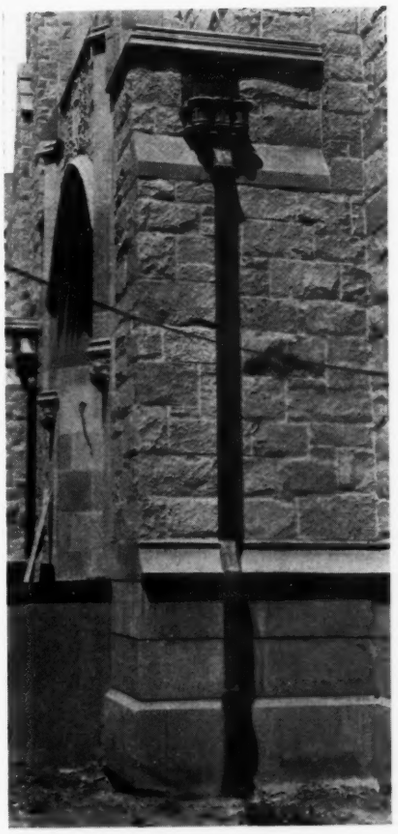
School

A section of the general contract entailed the addition of a third floor to the existing school building. The addition has a high peaked roof

Dormer faces were assembled as complete frames containing either louvres or windows. Narrow sheets around the frame were soldered to the molding and siding sheets and then to the frame



The dormer molding has this cross section. This shows assembly



The excellent character of the architect's design and the contractor's skill is plainly indicated by the ornate conductor heads

under which there will be a large area for school activities. This peaked roof is broken on all four sides by copper sheathed dormers.

One of the photographs shows applications of copper to these dormers. The sides are enclosed in standing seam copper, the sheets being cut in the shop and formed ready for seaming. Along the eaves there is a small copper molding, also formed in the shop. The molding was nailed to wood backing. The roofs are again standing seam with the sheets cut in the shop.

The faces of these dormers have steel window frames enclosed in copper. An enclosing copper face for the sash was fabricated in the shop and delivered to the job ready for erection. After the sash section was in place, side and top strips of flat sheets were installed and the whole face soldered together.

Drainage

All drainage is through exposed downspouts and ornamental conductor heads. These heads are quite ornate in design following the general theme of the tracery in the panels of the fleche. The heads were completely fabricated in the shop, assembled there and delivered ready to fasten on the walls. The conductor pipe is rectangular without ornamentation.

The copper gutters which run all around the nave and the transepts are of the box type.

Roof

The church and the school are roofed with slate applied by the Mansfield company. In the contract there was some 225 squares of roofing material.

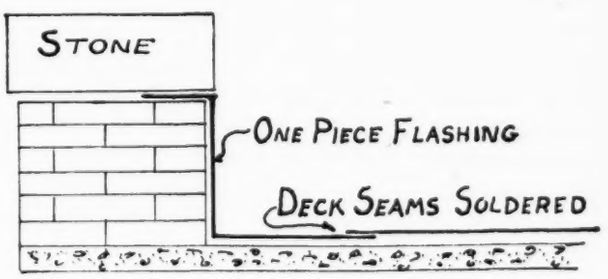
The ridges and the hips of the roof are finished in a rolled copper section prepared by the contractor.

In this contract some 20,000 pounds of copper, both lead coated and plain were used. Also, more than 2,000 pounds of solder were required.

The completed structure has been declared a definite contribution to church architecture in Chicago.

All decks are sheathed in copper with complete soldering of sheets as shown on this photograph of a sacristy roof. The copper is continuous up and over the window ledge

Around the sanctuary and transept ends wide copper gutters which also serve as roofing and flashing were adopted. Every sheet was tinned around the edges and completely soldered upon assembly. The drawing shows how assembly was made on the roof



FUNDAMENTALS OF HEATING

By G. A. Voorhees

HEAT LOSS

THE basis of all correct heating plant design, whether the building is heated by direct radiation, air circulation or a combination of these two methods, is *heat loss*. That is to say, before any plant can be intelligently designed, we must determine in some way *how much heat* the plant will be called upon to supply.

Most of the old time "practical" furnace men merely estimated the heat requirements of buildings. If they did any figuring at all, it was usually by the most crude rule of thumb methods. When such a furnace man was called upon to install a heating plant in a residence, if he went so far as to divide the cubic content of each room by 20 to determine the number of square inches of leader area needed to properly heat the room, he considered himself very "scientific."

His selection of furnace size was usually based on the number of cubic feet of space to be heated with little if any consideration of the nature or extent of exposed surfaces through which most heat losses took place. And the average furnace manufacturer was just as crude in his methods of rating his heaters.

He said to himself, "I know my 24-inch pot furnace will outheat so-and-so's 24-inch furnace. He rates his to heat 20,000 cubic feet of space; I'll just rate mine to heat 24,000 cubic feet." And that was practically the condition that existed until after the war, when Professor Willard went before a gathering of furnace manufacturers and told of his experiences as consulting engineer for the War Department. He pointed out to them that in buying furnaces to heat the army cantonments, the War Department was confronted by the wildest imaginable capacity ratings. Several different makes of furnaces of approximately the same size and having obviously about the same actual capacity, would carry widely divergent manufacturer's capacity ratings.

Information Important

When the manufacturers, after considering his remarks and recommendations, decided to seek an accurate and correct basis for rating furnaces and further to investigate and codify the principles of warm air heating, they started what has developed into the most elaborate and thorough research program ever sponsored and promoted by any trade association.

Because of the continuous and still growing mass of valuable data on furnace and plant performance, most of us who are directly engaged in warm air heating work as well as an encouragingly large proportion of the buying public, have been awakened to the almost unlimited possibilities of warm air heating, and more recently to the fact that the warm air heating plant is ideally suited to the development of the elaborate air conditioning system which extends beyond the realm of heating and seeks to provide comfort and guard the health in the home throughout the year.

But before the furnace man can hope to successfully apply the newly discovered basic facts and to make effective and profitable use of the newly developed principles of warm air heating plant performance, he must acquaint himself with some of the fundamental facts about heat.

By following the rules laid down in the present Standard Code regulating the design and installation of gravity circulating systems for residences, any heating contractor can install a gravity system in the average residence with full assurance that it will heat the building. But for even the simplest gravity system he needs more than the code to insure the best results; he needs a reasonably accurate knowledge of the fundamental principles on which the code itself is based.

Readers of American Artisan will not soon forget the excellent articles written in 1930 and 1931 by G. A. Voorhees under the title — "Fan Fundamentals." Those articles appeared at a time when fans and their application were a subject we were all discussing but knew little about. Now Mr. Voorhees releases to American Artisan another series of articles on basic principles of heating. These articles come at a time when many of us are harboring a mass of theoretical data, much of it uncorrelated. The idea of the series will be to select those principles which are of practical value and establish their position in heating. We are delighted to have this series. —*The Editors*

With the advent of fan heating, this need becomes even greater and we find many progressive, alert heating men who are becoming acutely conscious of their lack of a clear understanding of certain basic factors that affect plant design and plant performance.

These primary facts have been variously stated by a number of contributors to the AMERICAN ARTISAN and other trade journals but the number of inquiries from practical furnace men that have reached the writer from time to time have indicated a need of a systematic restatement of certain of these principles together with examples of their practical application in warm air heating work.

We have said that the first step in the design of any type of heating system is a determination of the heat loss of the building. But before discussing the actual calculation of heat losses, we should briefly consider heat itself. We deal with it day by day in our work and we should have some concept of what it is and how it travels from place to place.

What Is Heat?

For a definition we may say that

Heat is a form of energy which we cannot see, but can feel. Heat is said to be the setting up of rapid vibrations among the minute particles of a mass. These particles we call molecules. Wood heats slowly because its molecules vibrate slowly. Iron heats rapidly because its molecules vibrate rapidly.

heat is a form of energy which is assumed to be due to the rapid vibration of the invisible molecules of which all gases, liquids and solids are composed. We say it is "assumed" to be due to such vibration because molecules are too small to be seen through even the most powerful microscope, but numerous scientific investigations reveal certain facts which can be explained only by assuming such molecular vibration.

We measure heat in terms of readings from a thermometer. But in heating we must remember that temperature is not the whole story. We must know how much heat a substance or body contains. This measurement of quantity we call calorimetry and express it in terms of B.t.u.'s.

We know of no such actual condition as a complete absence of heat. Every substance with which we have to deal contains *some* heat. Even liquid helium at a temperature of more than 400 degrees below zero on the Fahrenheit scale is definitely known to contain heat.

Being a form of energy, heat can be measured both as to intensity and quantity. *Intensity of heat is called temperature* and in our work is measured in degrees Fahrenheit. (A degree Fahrenheit is 1/180 of the difference between the temperature of melting ice and the temperature of boiling water at normal atmospheric pressure.)

But—and this is vitally important —*temperature alone does not tell how much heat a given body contains.* The heat content of any substance depends upon:

(1) The temperature of the substance.
(2) The weight of the substance.
(3) The nature of the substance.

This measurement of heat *quantity* is called "calorimetry" and the only division of the subject with which we are vitally concerned in practical warm air heating work, is that which has to do with the heat content of air. It will be discussed in a forthcoming article of this series.

The B.t.u.

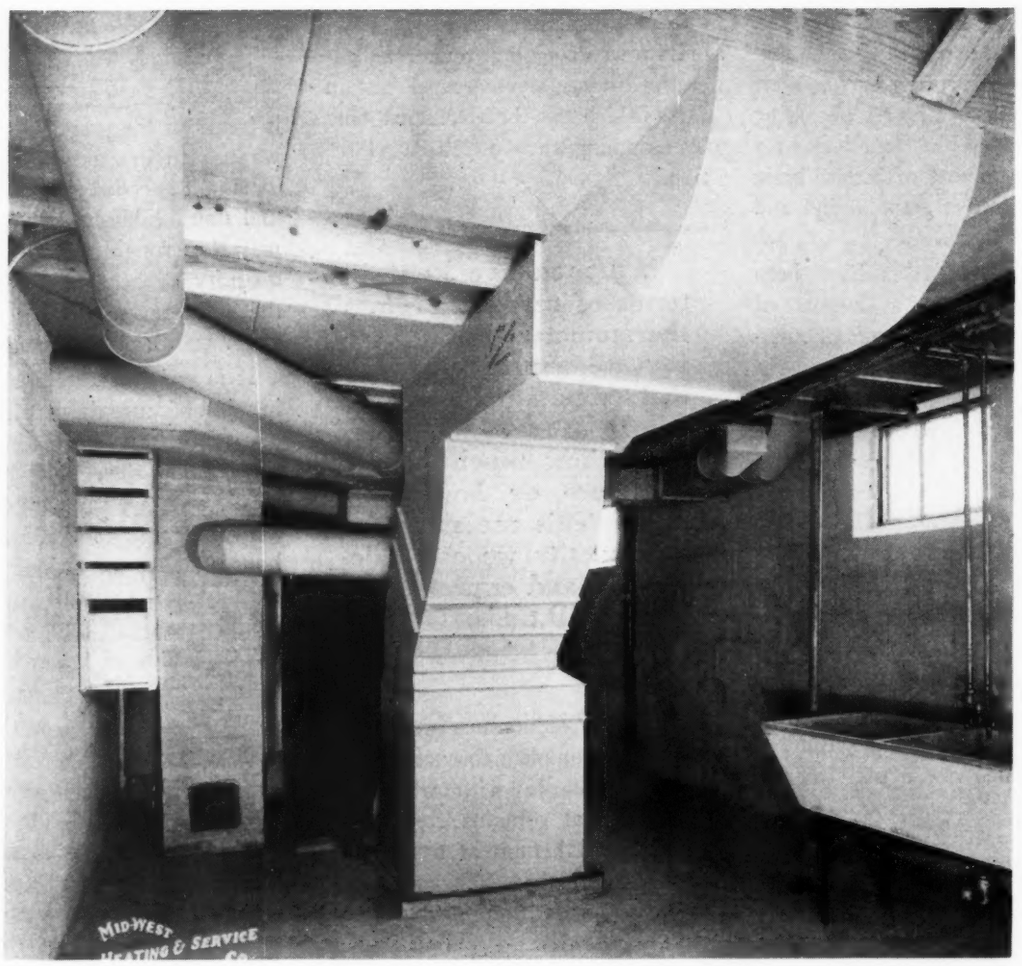
Just now we are interested in calorimetry only to the extent that it treats of the practical unit which we use to measure heat quantity. This unit is called the "British thermal unit" (abbreviated B.t.u.) and may be roughly defined as the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

It is well to keep this definition in mind because the B.t.u. is used in our practical calculations many times every day. But this doesn't mean, when we say the heat loss of a given room is 7,500 B.t.u. per hour, that we must think of it specifically as the quantity of heat that would raise the temperature of 7,500 pounds of water one degree Fahr. We use pounds, feet and hours in our daily work without giving a thought to their precise definitions; they are merely convenient units for comparing quantities with which we have to deal.

The same is true of the B.t.u., and we shall find as we become familiar with it, that it gradually takes on a fairly definite comparative value in our minds. Thus after we have familiarized ourselves with its use we'll find, when we determine

The B.t.u. is the basis of all heating calculations. We must understand what it is. We say a B.t.u. is the quantity of heat required to raise the temperature of one pound of water one degree F. In air, one B.t.u. will raise one cubic foot of air 55 degrees or 55 cubic feet of air one degree.

the heat requirement of a given residence to be 180,000 B.t.u. per hour, that we at once have a quite definite mental concept of the size of furnace needed to supply the heat. We'll also have some idea of the amount of fuel that will be required for a normal heating season.



Air Conditioning Sells a Model House

THAT semi-air conditioning systems can be sold to realtors if the proper emphasis is given the features of comfort, convenience and sales appeal was recently proved conclusively in Indianapolis when the Mid-West Heating and Service Company convinced a real estate firm erecting a model home that such a system would interest prospects and sell the house.

That the Mid-West company was correct in its declaration is indicated by the fact that on the opening day following the appearance of a newspaper story telling about the conditioning system, dozens of callers stated immediately that their purpose in visiting the house was to see this modern heating system.

Further indication of the pulling power of air conditioning was demonstrated when a neighboring home owner who visited the house purely out of curiosity became so enthused over the conditioning system that he ordered a duplicate for his home from the Mid-West company. Many additional inquiries were secured through the display.

Fan Replaces Gravity

The model home is located in one of the fashionable residential districts of Indianapolis and was built by the American Estates Company, realtors and builders of homes of the better type. The original plans called for gravity warm air plant, but upon hearing about the features offered by semi-air conditioning the real estate company saw in this type of system the ideal appeal to make their house distinctly different from all other speculative houses.

That the sales possibilities of air conditioning really appealed to the building company is shown by the fact that the conditioning system was sold for more than three times the amount allotted for the gravity installation.

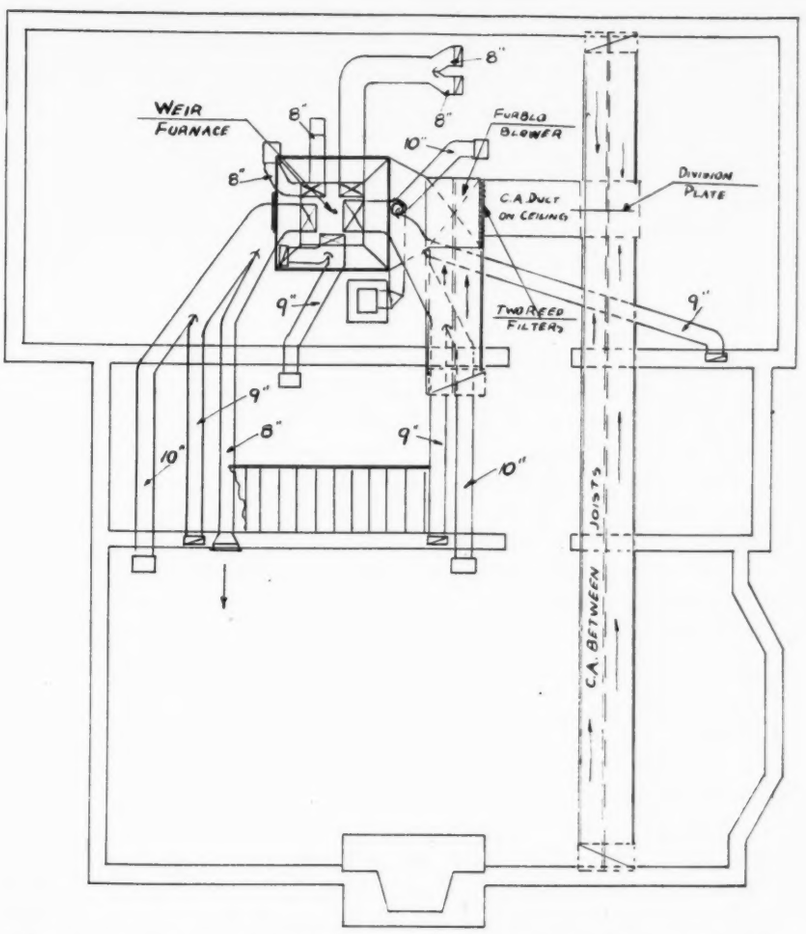
Selling air conditioning systems over the competition of other types of heating, or even selling to owners who have set a definite amount,

usually just enough to buy a moderately good gravity job, is not a haphazard proposition with the Mid-West company. As E. L. Carr, president of the company, says: "We are happy to be one of the first firms in our city to get into this semi-air conditioning field. Although we are not an old firm in point of years in business in Indianapolis, we felt sure there were great possibilities in air conditioning and determined to follow this new trend in domestic heating just as far as we possibly could.

"In order that we could tell the story as we saw it, we exhausted every available source of information in order that we would be capable of designing systems which would give the buyer the best possible service. This model home is a product of our own engineering ability. It is, also, some indication, I feel, of the fact that we have our feet on the ground and can deliver what we promise. We are proud that we can sell the type of buyer who purchases only after thorough investigation and who will complain loud and often if the system fails to live up to our specifications."

The model home is extremely attractive, yet in spite of the exterior it was the air conditioning system which brought out the prospects.

The system was described in newspaper publicity as a heating plant which provides ventilation and air circulation at all times in addition to filtering the air and providing some degree of summer cooling by maintaining air movement throughout all the rooms. With this sort of a description it is small wonder that hundreds of visitors came out to see this comfort device.

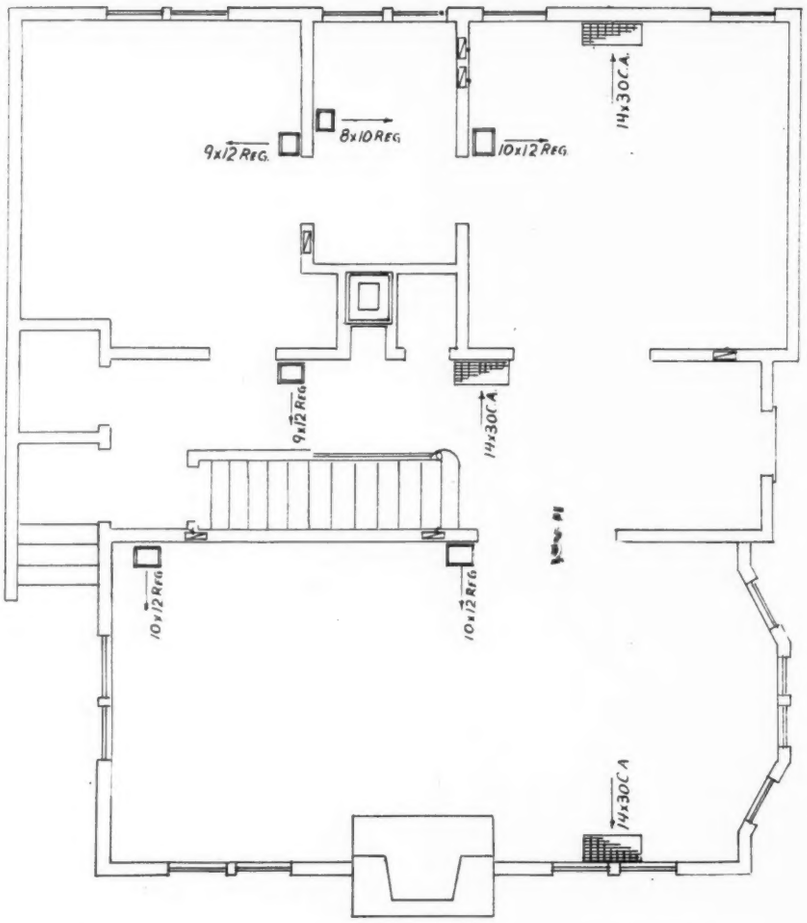


The piping plan shows how the leaders were taken off the bonnet as rectangular ducts, splitting into long, round-pipe branches soon after leaving the furnace. Returns are all from the severely exposed side of the house.

Equipment

There is little of a radical nature in the design of the system. Heat is supplied by a Weir De Luxe square-cased furnace, painted a Coolie blue crinkle baked enamel finish. The furnace front is a silver color to give a harmonious appearance. Air movement is supplied by a Furblo blower to which is attached two sections of Reed filter. Operation of the fan is under control of a Time-O-Stat located in the bonnet. There is a summer control for the fan located on the first floor and manually operated.

The color scheme of the heater is carried into the piping system by painting the warm air leaders a light buff color. The return air ducts which run below the joists are also painted in buff.



The distributing system for both floors is as simple as a gravity installation. All return is from the first floor, as shown. Registers on the second floor are in the baseboards.

The basement photograph shows round pipe leaders and one side of the main return. An interesting feature of the supply side is the use of these long round pipe leaders. The piping plan shows that these leaders come off the furnace as rectangular ducts, but are split to round pipe shortly after the ducts leave the bonnet. This arrangement permits the use of round pipe leaders to registers where it would be both expensive and difficult to run branches from mains.

These round pipe leaders all have quadrant dampers where they leave the rectangular duct. In addition, these leaders are all made of galvanized iron, tailored to the job, with every joint completely soldered. In all, five rectangular ducts are taken off the bonnet, two supplying three round pipe branches and three supplying two branches.

Return System

The returns from the house are all taken off the first floor through three floor grilles. All returns are carried between three joists to a point near the blower. The return from the hall and dining room are both short runs, but the return from the living room crosses practically the entire width of the house.

The basement photograph shows the return duct which connects these three runs into the blower cabinet. Living room and dining room enter this gathering return at its end, but the hall return is cut in directly above the blower. A division plate separates living room from dining room air stream.

Distribution

For a house as large as this one, the distribution system is exceptionally compact. In only two rooms, the living room and master bedroom is there more than one inlet. For the entire first floor all registers are centrally located along inside walls and are placed in the floor. On the second floor, baseboard registers are used.

In the basement there is a large recreation room across one side. This room is heated by one side wall register located high up from the floor. No return is taken from this room.

This model home, receiving the publicity it did, is reported to have done much to make Indianapolis home owners, builders and buyers aware of the fact that something new in heating systems is now available. The interest shown in the equipment demonstrated that the public is just as desirous of getting comfort, particularly heating comfort as ever before. The Mid-West company gained recognition as purveyors of modern heating through co-operating with the builder.

The coming spring will undoubtedly call for more activity on the part of the furnace dealer than any similar season we have ever been through. Automobile, mechanical refrigeration and electric range companies, and others are now launching campaigns to get the public's dollar. Our problem this spring will be to get small jobs which can be built up into bigger jobs. One of the best ways to do this is to push furnace cleaning. With this need in mind, the Merchandising Staff of *American Artisan* will begin in the April 11 issue a complete campaign to get cleaning business. Watch for it!

. . . the Problem Corner

Do Unexcavated Areas Kill Air Flow?

FOLLOWERS of the Problem Corner are invited to consider the problem shown in the accompanying plan. This particular problem deals with restricted flow caused by pipes passing through an unexcavated area.

Here is what the contractor reports on the operation and construction:

"Three leaders from the furnace pass through a heavy rock wall which surrounds the basement. Beyond this wall the area under the house is unexcavated. The leaders pass through a hole in the wall through a thimble giving at least 1 inch of air space all around the pipes. This thimble is plastered into the wall.

"Two of the pipes do fairly well while the third pipe which supplies the bathroom fails to deliver. All three pipes are covered with two layers of 12-pound asbestos paper and also a wrapping of corrugated asbestos paper.

"Just what exactly is the insulating value of the wrappings described and should the bare pipe have less loss than the pipes which are covered?

"The leader to the bathroom passes through one partition wall, then through a cold fruit cellar and then through the rock wall described. Just beyond the wall the leader turns up through the floor of the room above, through this room to the ceiling, through the ceiling and into a floor register in the bathroom above.

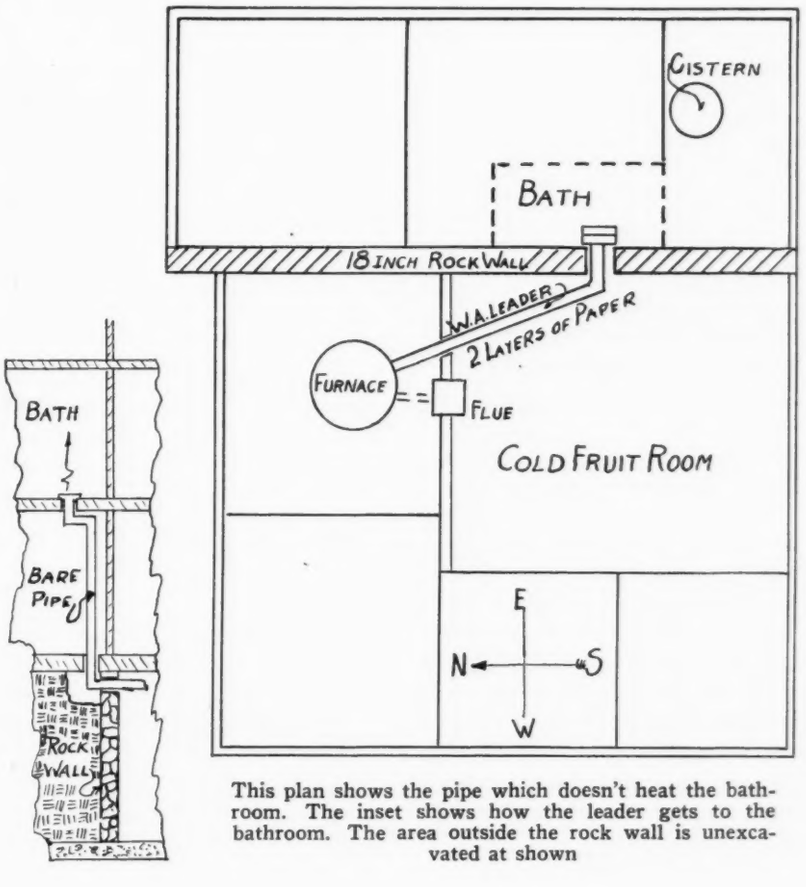
The leader through the first floor room is bare and hugs the wall. The pipe turns out at the ceiling to the register boot.

"What I want to know is—does an unexcavated area slow up the flow of warm air in pipes going through such an area and if so what protection can be given the pipes so that the runs will work?

"I would also like to know if it will help the situation if I ask the owner to knock out part of the masonry wall and build some sort of a room under the pipes so that this room will be the same temperature as the basement?

"The furnace has been checked several times and declared adequate. Also all the house heats satisfactorily except this bathroom."

The plan shows just how the system is laid out and the contractor's explanation seems to make the problem clear. Anyone having had experience with trouble jobs of this kind will assist this contractor greatly if they will send in the remedies they use on their jobs.



This plan shows the pipe which doesn't heat the bathroom. The inset shows how the leader gets to the bathroom. The area outside the rock wall is unexcavated at shown

FAN BLAST ENGINEERING

by PLATTE OVERTON
ENGINEERING EDITOR

Where and What Is Friction?

IT is impossible to design a practical duct system without resistance.

Resistance is often called "pressure loss" and may be said to be of two kinds—friction and dynamic.

Friction loss is probably the most familiar and, as the name implies, results from the friction of air moving over the surfaces of the ducts. This loss or "drag" of a moving column of air is easy to understand and visualize for we are all familiar with losses of this type.

Dynamic loss is just as easy to understand if we picture it as the loss which occurs when the moving column of air changes direction. Moving air acts just as your body does when your car turns a sharp corner. Your body wants to continue in the original direction and a momentary disruption in movement must take place before you straighten out in the new direction. Dynamic loss also occurs in a warm air system, when there is a change in velocity or rate of air flow.

These dynamic losses occur in a duct system at the connection of ducts with the plenum chamber, at elbows, at dampers, and nozzles.

Dynamic losses are generally expressed in *percentage of velocity head.*

Velocity Head

What is velocity head?

Let us picture a tank of water as Fig. 20 with a height of *A*. *B-b* is a pipe attached to the tank. We know, of course, that the weight of the water in the tank will force a flow out through pipe *B-b*. If there were no friction in this pipe, the velocity of flow would be the same at all points.

We know, of course, that there is always friction in any pipe. This friction slows up the flow of water and in this illustration will cause water to rise in the gage tubes.

The height of the water in the tank, in this case height *A*, determines the pressure exerted by the water in pipe *B-b*. The higher the water the greater the pressure. This pressure is called "Pressure Head" or in air "Total Pressure." If the pipe *B-b* is open at the end, the head *required* to give the water velocity through the pipe is called "Velocity Head." This will be less than the total pressure exerted or, in other words, less than the Pressure Head. The pressure not required to move water through the pipe is the static pressure.

For our problem with the tank of water we will call this answer *a* as shown on the drawing. The balance of the pressure which is equal to $A - a$ is spent in overcoming friction.

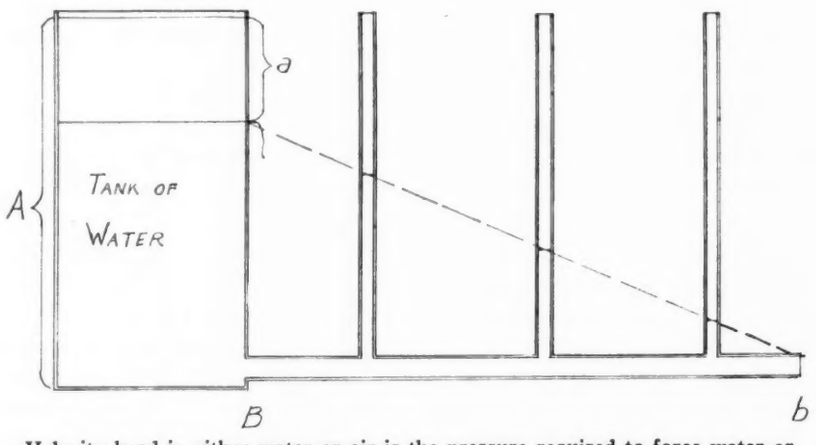
The basic formula for figuring velocity head is:

$Vs = m\sqrt{2gh}$, in which
Vs = velocity in feet per second
g = acceleration in feet per second due to gravity or 32.16
h = head in feet of column of air causing flow.

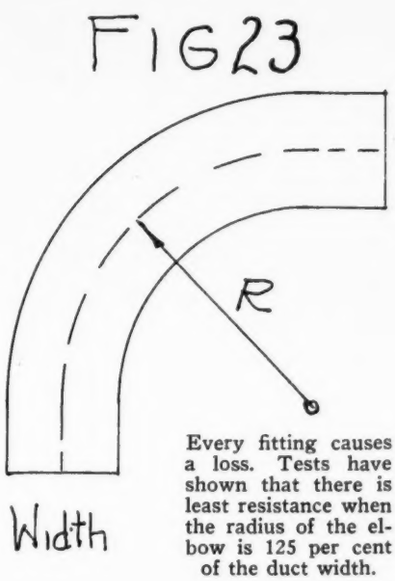
Loss in Elbows

Thus we see why pressure loss occasioned by elbows is generally stated as a function of the velocity head and is a dynamic loss. Such dynamic losses may be expressed in the terms of percentage of velocity

FIG 20



Velocity head in either water or air is the pressure required to force water or air through the distributing system. In this drawing, the amount of water necessary to make water flow out of the end of pipe B-b is the velocity head for this system. The pressure not needed is static pressure.



Every fitting causes a loss. Tests have shown that there is least resistance when the radius of the elbow is 125 per cent of the duct width.

head. Fig. 23 is an elbow and from tests has been found to have a loss of .75 of the velocity head. If our velocity head is .5 inches of water, our loss for this elbow will be .5 times .75 equals .375 inches of water.

The question: "How do we have any air left at the end of the duct if the pressure keeps dropping?" is often asked. Referring back to Fig. 20, the tank of water, we can say that theoretically if the pipe *B-b* were long enough and the pressure kept dropping until it equals atmospheric pressure at *b*, the water would not run out even with *b* open. However, we know that in practice the atmospheric pressure at the top of the tank would equalize the pressure at *b* and the pressure of *A* does the work.

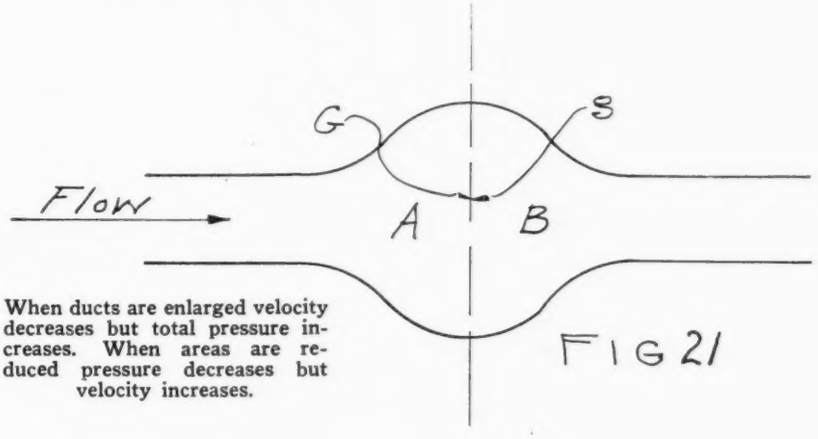
Pressure Loss

In reference to the pressure in the duct we have our constant volume at the end and with our fan we maintain the various pressures throughout the length to produce this volume at the far end. If we were to cut the duct off at half its length we would get a greater volume at this point due to the fall in pressure.

Pressure varies with the velocity. Let us consider the fitting in Fig. 21. At *A* the velocity is diminishing or we say the air is slowing up. The pressure is from all sides. Now if the velocity is diminishing at *A*, the pressure on the forward side at *g* must be greater than the pressure on the left side at *G* that is pressing forward. When the air reaches *B* its velocity is increasing and the pressure from behind must be greater than the pressure in front which is opposite to its motion. The point of greatest pressure must, therefore, be where the motion is the slowest.

At a point in the duct just before we reach the fitting in Fig. 21, we have velocity pressure and static pressure. In the fitting we also have these two pressures but we have more static and less velocity. As we enter the pipe beyond *B* we have an increase in velocity pressure and a decrease in static. This is termed static regain at *A*.

From this sketch we are able to visualize the fact that there is always some loss in efficiency when we change velocity to static pressure or static to velocity. In this fitting we have changed the velocity and have a dynamic loss.



When ducts are enlarged velocity decreases but total pressure increases. When areas are reduced pressure decreases but velocity increases.

We frequently encounter the expression of so many "velocity heads." This refers to dynamic losses and if we have one plenum chamber entrance to the duct, 3 elbows, and one transition fitting where the velocity is radically changed we say we have a loss of 5 velocity heads. We must produce the velocity head or pressure that will be equal to these 5 fittings. If we have but .25 or ¼ inch of water for velocity head, these 5 fittings should be designed to $\frac{.25}{5} = .05$ inch of water each or 20 per cent of the velocity head.

In the design of piping systems good practice will require elbows with long easy curves—15 to 20 per cent of the velocity head may be termed good practice. In Fig. 23, *R* should in most cases be equal to 125 per cent of the duct width.

In the case of friction it is well to remember that friction varies—

1 —Directly according to the length of the duct.

2 —Indirectly as the diameter of the duct.

3*—Directly as the square of the velocity.

For 3 we may say that the friction between the air in motion and the surface of the pipe may be said to cause a loss of head which numerically should be equal to the pressure required to maintain a given velocity. However, this friction will vary with the size of the duct, the shape, and the material it is constructed of.

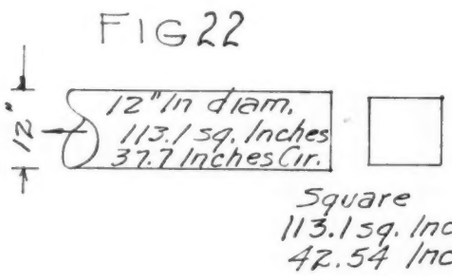
Friction Loss

Let us refer back to Fig. 20. If the pipe *B-b* is smooth inside, the height of *a* will increase and we will have a higher velocity. If the pipe is rough inside *a* will decrease.

*This rule should be changed to "substantially" as the square of the velocity. In a very large duct with slow velocity the friction may vary DIRECTLY as the velocity. In very small ducts as used in mechanical systems in homes very little is known of the relation of velocity to friction loss, but for small ducts with 50 or 60 c.f.m. and velocities of 300 or 400 feet per minute the rule is wrong.

However, the height A still remains $a + (A - a)$, and the velocity will decrease, thus the volume at b will also decrease in quantity per time unit. Referring back to the statement that the friction will vary with the size of the duct, we will here attempt, at least temporarily, to avert some complicated formula and explain in as simple words as possible how friction varies indirectly with diameter of the duct.

Fig. 22 is a duct 12 inches in diameter with a velocity of 1,200 feet per minute. We state that the more rubbing surface the more friction, but if we attempt to cut down the rubbing surface of this 12-inch pipe, we must make the diameter smaller and this will increase the velocity, as our volume is constant.



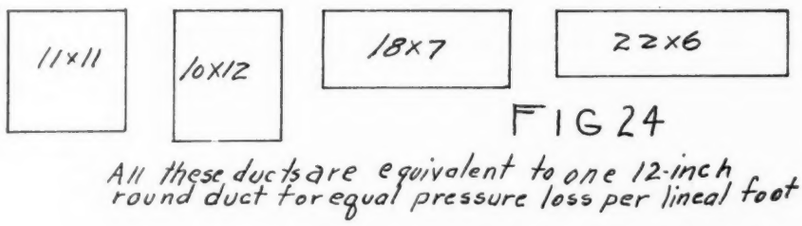
This round pipe has the same area as the square duct, but the square duct has 8.8 per cent more rubbing surface, hence more friction.

We have already said that the pressure loss varies directly as the square of the velocity or nearly so.

If we change this 12-inch round duct to a square duct with the same area, we have: 12-inch round duct equals .7854 square feet times 144 equals 113.1 square inches. Side of equal square equals $\sqrt{113.1}$ equals 10.64 inches.

Now a duct 10.64 inches square has a rubbing surface of 4 times 10.64 equals 42.54 inches, while a 12-inch round duct has a rubbing surface of 12 times 3.1416 equals 37.7 inches or 8.8 per cent less than the square duct of the same area. It is obvious that our pressure loss in the square duct will be greater. Thus we change the 12-inch round duct to a square or rectangular duct with the same pressure loss per lineal foot. Complete tables of such changes have been worked out for our use.

In Fig. 24 all the ducts have the same pressure loss per lineal foot and are equivalent to a 12-inch round duct. They all vary in the amount of rubbing surface and area.



Tables showing equivalent friction losses per linear foot are corrected so that ducts like these have the same resistance as the equivalent round pipe.

THE MISSOURI CONVENTION

THE twelfth annual convention of the Missouri Sheet Metal Contractors' Association was held on Saturday, March 19, in the Hotel Baltimore, Kansas City. In spite of business conditions, a good attendance was recorded, about evenly divided between contractors, manufacturers and their representatives.

Perhaps the most important discussion of the convention centered around the analysis of how manufacturers' and jobbers' salesmen can help the industry by talking "better prices." This matter of better prices was, the convention declared, the most important single thing needed in both the sheet metal and furnace industries.

Paul Reed, of Warm Air Heating, mentioned and talked about several excellent air conditioning systems installed in and around Kansas City. This led the meeting into a general discussion of the importance of this development. Several problems were brought out for discussion and worked out by members.

Most of the business of the organization was concluded at the morning meeting, also in committee meetings.

The convention was brought to a suitable close with a Dutch luncheon served in the shop of Martin Steinmetz, sergeant-at-arms.

The selection of the convention city and convention date for 1933 was left to the board of directors to be selected at a later date.

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WHAT IS AIR?

Success in the sale of air conditioning depends, at this stage of the campaign at least, on how complete a story of air and its importance the salesman can picture. Air and its properties must also be understood if the contractor is to understand why certain phenomena occur in every air conditioning system. With this need in mind, American Artisan has asked Malcolm Tomlinson, well known for his research work in warm air, to prepare a series of articles fully covering air and its properties as related to air conditioning.—The Editor.

By **MALCOLM TOMLINSON**
Consulting Engineer

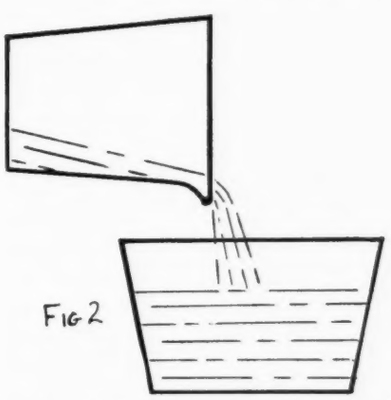
AIR is one of the commonest gases known. In fact it is made up of a mixture of quite a number of gases. These consist of oxygen, nitrogen, carbon dioxide, some of the rare gases such as argon and helium and the *gas which is called water vapor.* The composition of air is fairly constant as far as oxygen and nitrogen are concerned. As they represent the major portion of air's composition the other gases present are of little importance except carbon dioxide and water vapor. The latter gases vary considerably in air mixtures. Carbon dioxide indicates the condition of the air in buildings while water vapor plays an important part in human comfort.

Oxygen

Oxygen is one of our most important elements. It represents one-quarter, by weight, of all the air surrounding the earth, eight-ninths of all the water on the earth and a large portion of all the materials found on the surface of the earth. Oxygen has no taste, color or odor and is slightly heavier than air. It dissolves in water to some extent and, under such conditions, removes odors from sewage, enables fish to breathe and gives drinking water a pleasant taste. Oxygen has remarkable ability to combine with other elements. One of its slower reactions is the formation of rust on iron and steel. Its most rapid reactions are evidenced by terrific explosions. The speed of an oxygen reaction is increased by raising the temperature of the surrounding air.

Nitrogen

Nitrogen furnishes nearly four-fifths of the air, by weight, and is found in many compounds. These include the proteins in many foods, and the reactions of animal and vegetable matter. The proteins are vital to the life processes. Nitrogen is lighter than air; has no color, odor or taste and does not dissolve in water as readily as oxygen. It does not mix easily with other elements and its compounds decompose violently. Nitroglycerine and guncotton are two nitrogen compounds made by chemists for use as violent explosives.



Carbon dioxide is heavier than air. It can be poured, just like a liquid, from one container to another. This accounts for the fact that carbon dioxide and carbon monoxide always lie next to the floor

Carbon Dioxide

Carbon dioxide is formed by decaying vegetable and animal matter, the combustion of fuels and the reactions of oxygen in plant and animal life. It has no color and very little odor or taste. It is one and a half times heavier than air. Like other heavy gases it may be handled as though it were a light liquid. It can be poured, for example, from vessel to vessel (Fig. 2). It dissolves in water at a ratio of one volume to each volume of water. Since a flame can not exist in the presence of carbon dioxide it is of great value in chemical equipment for extinguishing fires. It is not

harmful, from a ventilation standpoint, unless its proportion to the air is much above the average and the latter condition is by no means usual. It increases in its percentage ratio to air where odors are objectionable, where there is an excess of heat and in occupied rooms where the air is stagnate.

The existence of argon was first found by examination of the spectrum of the sun. On the earth it is a very rare gas. Helium is now used to fill the gas chambers of dirigibles by the United States Navy as it is not inflammable.

Dry Air

So far the gases discussed make up an air mixture which is perfectly dry, or bone dry. It is impossible to find such air under natural conditions and it would be very expensive to provide such air by mechanical processes. For this reason its only use is in the laboratory. Dry air, from a commercial and industrial standpoint, may be mixed with only a trace of water vapor or might actually have a fair proportion of water vapor in its makeup. The term "dry" is therefore comparative only.

Water Vapor

Water vapor is put into air by the evaporating effect of the sun's rays on the surface of water and by many processes used by man. Even in desert regions it is found mixed with dry air. The amount present in any air mixture varies constantly and depends on factors such as temperature and locality. We will discuss the relation of temperature with air-water vapor mixtures in the articles to follow.

The effect of locality can be very well illustrated by the reasons for the existence of deserts. When warm air passes over large bodies of water it mixes with the water vapor which is evaporating from the water's surface. In this way ocean breezes become moist or humid. A decrease of temperature may cause part of this water vapor to condense in the form of rain, fog or snow. This is exactly what happens when the moist ocean breezes move landward and reach mountains (Fig. 3). As these moisture-laden breezes rise to cross mountains they enter a colder region of the atmosphere and a portion of the water vapor returns to the liquid form and falls on the seabord side of the mountain range. On the summits of the mountains more moisture may condense in the form of snow. Thus a much drier air passes over the mountains and enters the valley beyond. It, therefore, has little or no moisture for the valley which, quite naturally, suffers from a deficiency in rainfall.

Dry air and water vapor vary considerably in their properties. The density, or weight in pounds per cubic foot, of dry air decreases and the density of water vapor increases as the temperature rises. Furthermore, the volume of air which is actually dry increases as the temperature increases. The latter fact is responsible for considerable extra work in many air calculations where the basis of figuring is a cubic foot of dry air. This is due to the fact that there are usually a number of temperatures or temperature changes connected with the problem at hand and the volume must be recalculated for each change. Most air conditioning problems use the pound of dry air as a basis because it remains the same for all temperatures. At the end of the latter calculations it is very easy to convert the pounds of dry air into cubic feet for a definite temperature.

So far we have considered air without its impurities. These consist of dusts, bacteria, pollens and odors. The first three are tangible and can be seen through the microscope if invisible to the eye. The last, like water vapor, is invisible and thus presents a more difficult problem than things which can be held and observed easily.

Nature provides the laws which control the action of air and vapor whether the air be in the mountains or in a closed heating system. Clouds, for example, clearly show how moisture is suspended and dropped as temperatures vary

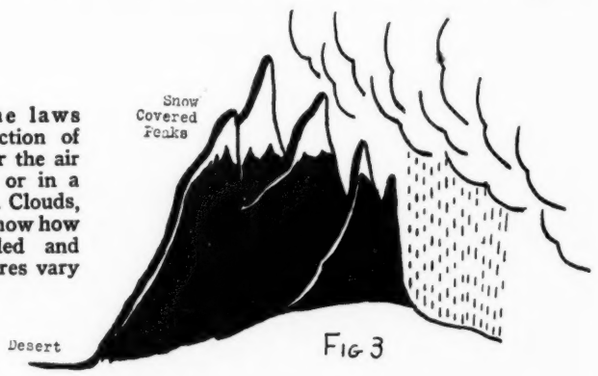
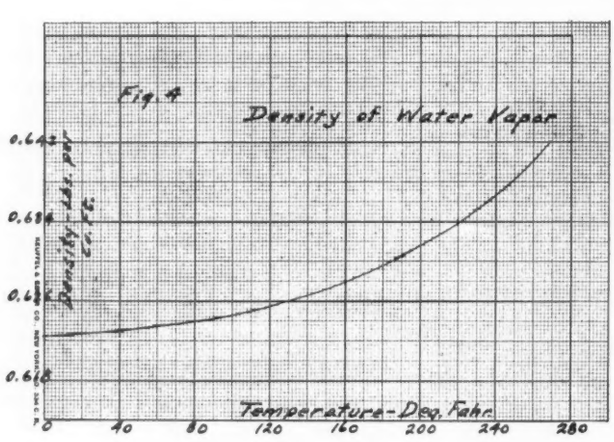


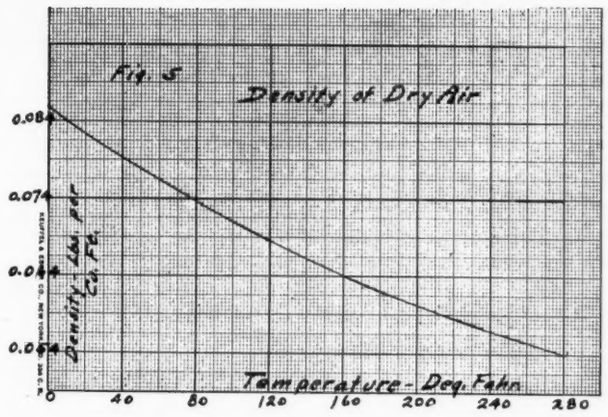
FIG 3



Air does not HOLD water vapor. Vapor is diffused throughout any air volume and is self-supporting. The amount of moisture which will occupy any given space depends on the temperature of the air. This chart shows how vapor volume varies with temperature

Dusts

Dusts might be divided into two classes consisting of those from the upper atmosphere and those from the earth's surface. Atmospheric dusts are meteoric or volcanic in their origin and are, therefore,

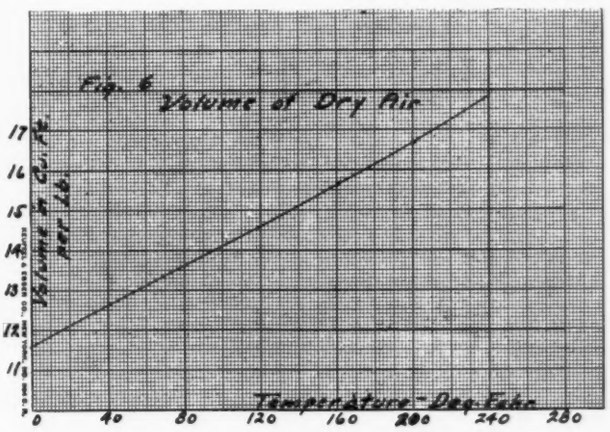


As the temperature drops, the density of dry air decreases, as shown in this chart. Since density is a direct indication of weight, we know that the weight of air also decreases as temperature increases.

gritty. Volcanic dusts result when volcanoes erupt. Great explosions may carry the dust clouds as much as fifty miles above the earth. This distance is startling when one considers the very much shorter distance which has been achieved by the airplane. The results are even more startling. Such dust clouds form a thin veil and trail after the revolving earth for periods as long as three years before they finally reach the earth once more. In the meantime the immense number of dust particles in the cloud form a partial screen against the rays of the sun. During the interval in which the dust cloud exists the average temperature of the earth directly below the cloud is lowered by from one to two degrees. Two degrees does not seem an important item but, for the farmer, it is equivalent to moving his farm 160 miles farther north in this country. Harvests are delayed and even crops are damaged.

Dirt

Earth dusts consist of lints and other household refuse in small particles, stable manure, sands and grits, fumes and smoke particles. Fumes and smokes frequently contain sulphur which, in the presence of moist air, forms sulphuric acid.



Volume of dry air increases as temperature increases. This is directly opposed to the action of density. The line on this chart shows the variation in volume- with different temperatures.

Bacteria, or germs, multiply at extremely fast rates under favorable conditions of temperature and moisture. Temperatures below 50 degrees are necessary to render bacteria inactive, but high temperatures are essential for their destruction. Moist air and summer heat encourage their growth.

Pollens from flowers, grains and grasses are mainly responsible for hay fever, while dusts from the large cities and factories affect the throat and lungs. Studies on the effect of dusts and pollens are now being made in a number of laboratories and startling facts probably will be unearthed.

The amount of water vapor and impurities mixed with air varies greatly. For the sake of clearness it is necessary to indicate, when speaking about air, just what kind of air is meant. Thus filtered air with very little water vapor is known as clean, dry air although some impurities and water vapor are in the mixture. The word air indicates a mixture which may have objectionable amounts of impurities and water vapor. On the other hand dry air refers to air which is almost free of water vapor, but which may have many impurities since it has not been filtered.

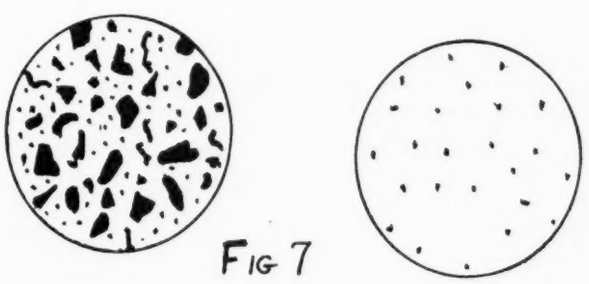


FIG 7

The microscope shows what a filter does to a heating system. The circle at the left shows unfiltered air. The circle at the right shows the same air after passing through a filter

Air conditioning is simply a mechanical process through which the amount of water vapor mixed with the air is regulated, the major portion of impurities are removed and the heat content of the air is tempered to meet the particular heating and cooling requirements of homes, commercial buildings and factories.

Without having examined its characteristics it is now possible to say that air is a mixture of gases which insure its purity and of objectionable matter and smells which endanger human health and foods. With the aid of air conditioning we can meet the year round menace which air presents and also obtain the benefits of pure air.

Is There Anything to This Idea of Cooling With Basement Air?

IN the last five months there has come to the editors of AMERICAN ARTISAN a very noticable number of inquiries asking "what is there, actually, to this proposition of summer cooling by means of basement air?"

In order to answer these inquiries it is necessary to draw on fundamental physical properties of heating and cooling in order to avoid generalities which may be good selling talk, but lead only to trouble.

In order to discuss this matter of using basement air for cooling, let us take a typical house, such as the one shown on the drawings, and find out just exactly what can be done with such a system.

We will all admit that as a general rule basements are from 5 to 15 degrees cooler in hot weather than the first floor and even farther below the temperatures of the second floor. There are certain fixed reasons why a basement is cooler than the floors above.

Why Basements Are Cool

First, most of the basement area is below the level of the ground around the house. We know that the earth is cooler under the top six inches or foot of earth. This cool earth being in contact with the walls of the basement extracts heat units from the basement walls and so reduces the temperature of the walls to a point approximately equal to the temperature of the earth.

Second, basement air is cool because air in the basement is stagnant, it is not circulated, nor is it being constantly replaced by hot air filtering in from the outside.

Third, basement air is cool because the basement acts as a well into which settles the coolest air inside the house.

Fourth, basement air is coolest because the average basement has few windows, which are usually small, and more important kept closed. In most houses, also, these windows because of their location are screened from direct sunlight for the greater part of the day.

If we install a fan in the basement and open the fan to the basement air, we immediately set up a recirculation of air throughout the house. In this recirculation the air from the basement is pulled out and forced into all the rooms of the house. The return system brings back to the basement hot air from the first floor. This hot air is mixed with the basement air until a state of balance in temperature is reached. When this point is established THERE IS NO LONGER ANY COOLING EFFECT FROM AIR PUT THROUGH THE FAN.

This statement must be qualified. Actually, it means that there is no decrease in temperature in the air circulated, but there is the cooling effect which comes from causing a breeze throughout the rooms. In order to make this cooling effect noticable, large volumes of air, at higher velocities than used in winter heating, must be maintained.

The Cubage Fallacy

This brings us to the consideration of just how long will the air in the basement remain colder than the air from the floors above.

To solve the problem we must go back to the proposition of heat exchange. What we are attempting to do is to cool the air from upstairs by extracting heat units. Our

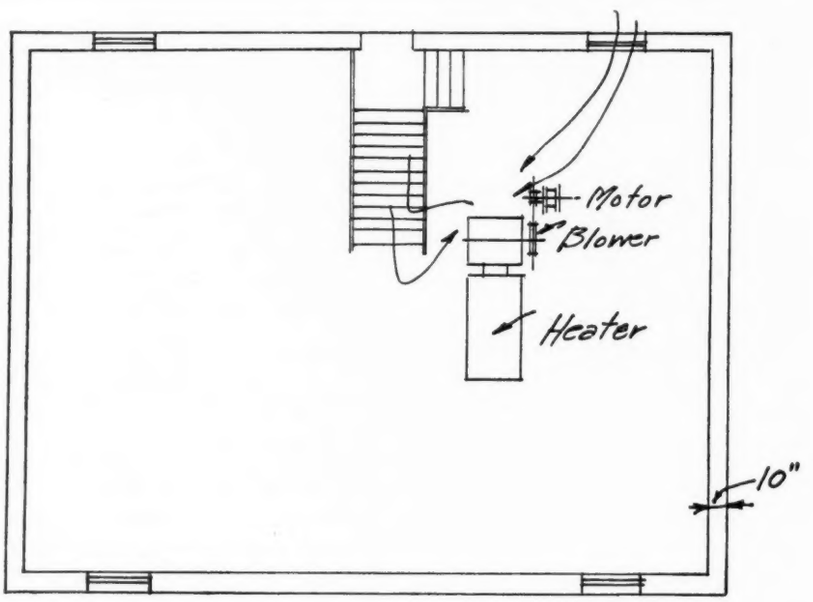
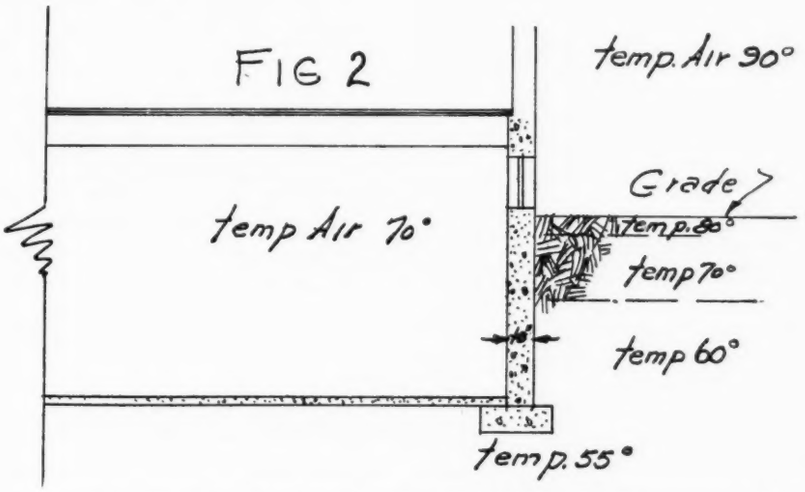


FIG 1

The area of the basement is 30 ft. × 40 ft. × 7½ ft. The total cooling effect available is 5,409 B.t.u. per hr. The house needs 19,275 B.t.u.'s. We fall this far short of cooling.

method of extraction in this system is to pass the heated air over such cold surfaces as the walls and floor of the basement. These surfaces being as cold as the earth outside draw the heat out of the air.

The man who says he will cool because he uses the cold basement air is on the wrong track. Such a system won't work. What he must do is cool air by taking out heat units by passing air over cold surfaces.



We may expect to find these temperatures around the average basement. The cooling effect available is indicated in the article.

To solve the problem we must reverse the customary B.t.u. heat loss calculations. The easiest way to picture this problem is to take the house shown on the drawings and make our calculations.

Cooling Calculation

The area of this house is 30x40 feet. Let us assume that this house has a 90,000 B.t.u. loss for a 70-degree rise which is average. This gives us 90,000 divided by 70 equals 1,285 B.t.u. per degree rise. With a 15-degree difference from outside to inside for cooling, we must extract or remove 15 × 1,285 = 19,275 B.t.u. per hour. This is equivalent to more than 1 ton of refrigeration in 24 hours.

Figure 2 shows a cross section of the basement. On the drawing we have shown temperatures which exist outside of the basement wall and floor. If the temperature outdoors is about 90 degrees the ordinary basement will be about 70 degrees. The temperature of the earth just under the surface will be 80 degrees. For a distance of perhaps two feet down the temperature will be 70 degrees. From this point to the level of the basement floor the temperature will probably be 60 degrees. The temperature under the basement floor will be lower—probably 55 degrees.

What we will attempt to do is to maintain the basement air at 70 degrees or 20 degrees under the outside temperature.

The basement walls are 10-inch concrete. Our tables for coefficient of heat transmission show that the rate of heat loss through such a wall is .455 B.t.u. per square foot of area per hour per degree difference between air outside and inside the wall. This figure is for exposed walls at a wind velocity of 15 miles per hour. Since the basement wall is not exposed, the .455 should be corrected to .431, which is our coefficient.

Since the air in the basement is to be 70 degrees and the temperature outside the wall is 60 degrees we find the B.t.u. loss to be .431 × (70 — 60) or .431 × 10 = .431 B.t.u. per square foot.

The floor loss is figured the same way. The coefficient is .503 for a light concrete slab. Our calculation is, then, .503 × (70 — 55) = .503 × 15 = 7.545 B.t.u.

The area of the wall BELOW GRADE is 770 square feet. 770 × 4.3 = 3,311 B.t.u. loss per hour.

There is 1,200 square feet of floor area so we have 1,200 × 7.545 = 9,054 B.t.u. loss per hour. The total loss for the basement below grade is, then, 9,054 + 3,311 = 12,365 B.t.u. per hour.

However, this total heat extracting ability is somewhat offset by the area of the basement above grade for—**the area above grade is warmer and will, therefore, give up its heat to the cooler strata at the bottom of the basement.** The cooling ability of the area above grade is, then, practically nothing.

Here is how it figures out:

There are 280 square feet of wall and 4 windows with a total of 20 square feet. Our wall factor or coefficient .43 × (90 — 70) = 8.60 × 280 = 2,408 B.t.u. Our glass coefficient is 1.2 × (90 — 70) = 24 × 20 = 480. 2,408 + 480 = 2,888 B.t.u.

To this we must add the ceiling that we will assume has a 10-degree difference. Our coefficient for 2 inches of floor or wood joists is .339 × 10 = 3.39 × 1,200 = 4,068 B.t.u. This we add to 2,888 equals 6,956. This we subtract from 12,365 leaves 5,409.

Now this number of B.t.u.'s, 5,409, is what we have available for cooling. This brings up the point often overlooked, namely—**it is not the cubage of the basement which counts, but the area of cold surfaces which will extract heat units.**

This means that we have 5,409 B.t.u.'s available for cooling providing we can put all the air from upstairs in contact with the cold walls and floor. You can picture what this requires — a false floor and false inner walls to provide the space through which the air from upstairs must be passed to cool.

The basement proper contains 9,000 cubic feet of space and if this were allowed to cool to 70 degrees and the fan started—we will assume a fan with a capacity of 1,500 c.f.m.

(Continued on page 47)

You Will Lose Money If You Don't

KNOW YOUR COST FIGURES

By
JOSEPH G. DINGLE, C.P.A.

ONE of our good friends sent us his cost figures on a number of furnace jobs, and we are going to use some of them in this article to show you how things may be alike—yet different. Out of the several jobs, we have selected three for use here. We selected these three jobs for the reason that in each case four rooms were heated, and they may be assumed to be practically alike. Here are the figures as we received them:

	No. 1	No. 2	No. 3
Material	$ 94.34	$ 98.98	$ 97.45
Labor	21.30	27.70	25.60
Prime Cost	$115.64	$126.68	$123.05

Now we have, let us say, determined that our overhead is 25% and we desire a profit of 10% in material and labor estimates as follows:

Job	Sale Price	Material	Labor	Prime Cost	Gross Profit
1	$178.00	$94.34	$21.30	$115.64	$62.36
2	160.00	98.98	27.70	126.68	33.32
3	185.00	97.45	25.60	123.05	61.95

These jobs were actual results obtained by one of the warm air heating shops and should prove of interest. We want to take these figures to pieces and see what is in them. There are two approaches to this problem, and we shall try to show you each approach and how much the three jobs vary in the actual results obtained. Notice, if you will, that we have not shown the overhead and net profit. This was omitted for the reason that overhead varies greatly in each shop, and we can illustrate our points just as well by using overhead and profit as a combined figure—which is, of course, gross profit.

Material and Labor Estimate

Let's attack this proposition first from the estimate point of view. That's where we usually start on a job and our sales price is arrived at by first estimating our material and direct labor costs. We will, then, take off our jobs and find our sales; therefore, our prime costs, shown above, must equal 65% (100% minus 35%) of our sales prices. By multiplying by 100 and dividing by 65, we arrive at our selling prices for the three jobs, as follows:

	No. 1	No. 2	No. 3
Selling Price	$177.90	$194.89	$189.30

Having determined these selling prices we are ready to see our customers and land the jobs. Customer No. 1 was all right and we got that job for $178.00—just a dime added to make even dollars. Customer No. 2 was a hard trader and, evidently had a price from a shop whose costs were incomplete and inaccurate. Our man wanted the job and met competition, taking the contract for $160.00 or $34.89 less than he should have. Customer No. 3 was booked at $185.00 or $4.30 less than the price actually figured. We will assume that the material and direct labor costs were actually as estimated. The selling prices were $178.00, $160.00 and $185.00. Now, that the jobs are completed and our cost records closed, we can determine the results. In order to show more clearly the break-up of the customers' dollars, we here show the three jobs, each sliced three ways, representing materials, direct labor and gross profits. Remember, if you will, that each job was figured on the same basis as the others, but that on job No. 2, the price was cut from $194.89 to $160.00.

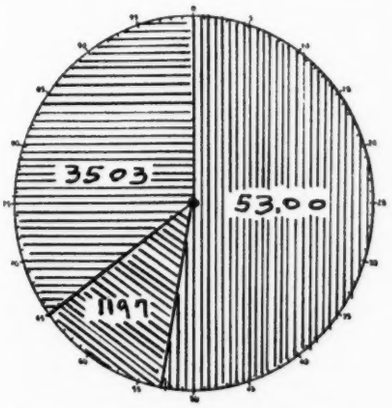
How Money Was Lost

These sales dollars, particularly Nos. 1 and 3, are very nearly alike, but No. 2 shows a quite different story. Gross profit, on account of the cut in sales price, decreases from the figured 35% to 20.82%. We have assumed our overhead to be 25% of our selling price. Our selling price on job No. 2 should have been $194.89, and on that price, our overhead would be

Sales Price		$160.00
Material	$98.98	
Labor	27.70	
Overhead (25% of $194.89)	48.72	
Total Cost		$175.40
Loss on Job		$ 15.40

$48.72 for this job. When the sales price was cut to $160.00 our shop owner gave some of his own money away to get that job.

Of course, our illustration of job No. 2 shows a gross profit of 20.82% in the dollars actually received for the job. But there we



On job number 1 the selling price gave the dealer actual figures of—Materials, 53%; Gross Profits, 35.03%; Direct Labor, 11.97%

have failed to consider that the job was actually priced to sell for $194.89. The selling price reduction did not, of course, reduce the cost of the material and direct labor required to do the job; it did, however, materially increase the percentages which material and labor bore to the sales price, and by increasing these percentages the gross profit percentage was decreased accordingly.

Had our shop owner given a little thought to the matter of meeting competition, he would have realized that his price of $194.89 was built up of the following items, and percentages:

Material and Direct Labor	$126.68	65.00%
Overhead	48.72	25.00%
Profit	19.49	10.00%
Total, as computed	$194.89	100.00%

Of course, conditions may have warranted cutting this price to $160.00 but did our friend realize that he was actually paying $15.40 for this job. He cut $34.89 off his price when he had only $19.49 figured as profit.

	No. 1	No. 2	No. 3	Totals
Material	$ 94.34	$ 98.98	$ 97.45	$290.77
Direct Labor	21.30	27.70	25.60	74.60
Overhead	44.47	48.72	47.33	140.52
Total Costs	$160.11	$175.40	$170.38	$505.89
Sold for	$178.00	$160.00	$185.00	$523.00
Profit	$ 17.89	(L)$ 15.40	$ 14.62	$ 17.11

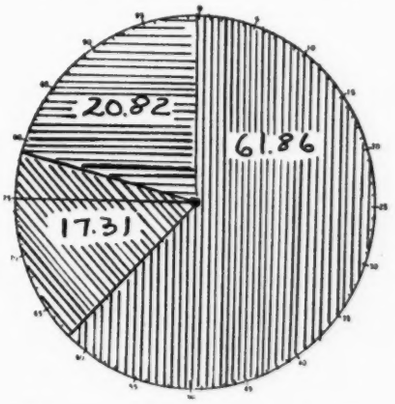
What Price Cutting Means

Now let's put these three jobs together and see what that price cut means. We will use as our overhead the 25% of selling price—before price cut, and our profit at the 10% figure.

Job No. 1 shows a profit of $17.89 or 10% of the sales price, plus the ten cents added to make the price even dollars.

Job No. 2 shows a loss of $15.40.

Job No. 3, which originally figured $189.30, was sold for $185.00 and this price reduction of $4.30 was all out of profit. Where we added $18.93 for profit, we gave, in the price cut, $4.30 to our customer and ended up with only $14.62 for a final profit.

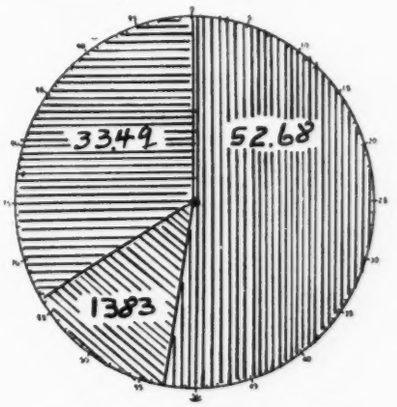


Job number 2 gave the dealer actual figures of—Materials, 61.86%; Gross Profits, 20.82%; and Direct Labor, 17.31%

Where we started out to get a profit of 10% on $562.09, or $56.20, we ended up with a profit of $17.11 on sales of $523.00 or 3.27%. Price cutting certainly does not pay.

Now, let us assume that the figures shown in the total column above are representative of our year's work and we are ready to compute our overhead for the new year. We find that overhead, originally figured at 25% of our sales, actually amounted to 26.87%. Therefore, in order that we might, during the new year, build our selling prices to yield, say 10% profit, we should raise our overhead percentage from 25% to 26.87%. This increased overhead is due solely to the fact that we did not get as much for our work as we should have. Where we were working for a 10% profit we received only 3.27%.

Now there is still another side to this proposition. The customer should pay what the job costs plus a fair profit. The shop owner, who, through lack of adequate cost data, offered to install job No. 2 for $160.00 certainly is to blame for at least a part of this upset condition. His lack of accurate knowledge concerning overhead and other vital elements of cost in his shop caused him to lose money on his own work, and for his competitors also.



On job number 3 these figures were—Materials, 52.68%; Gross Profits, 33.49%; and Direct Labor, 12.83%

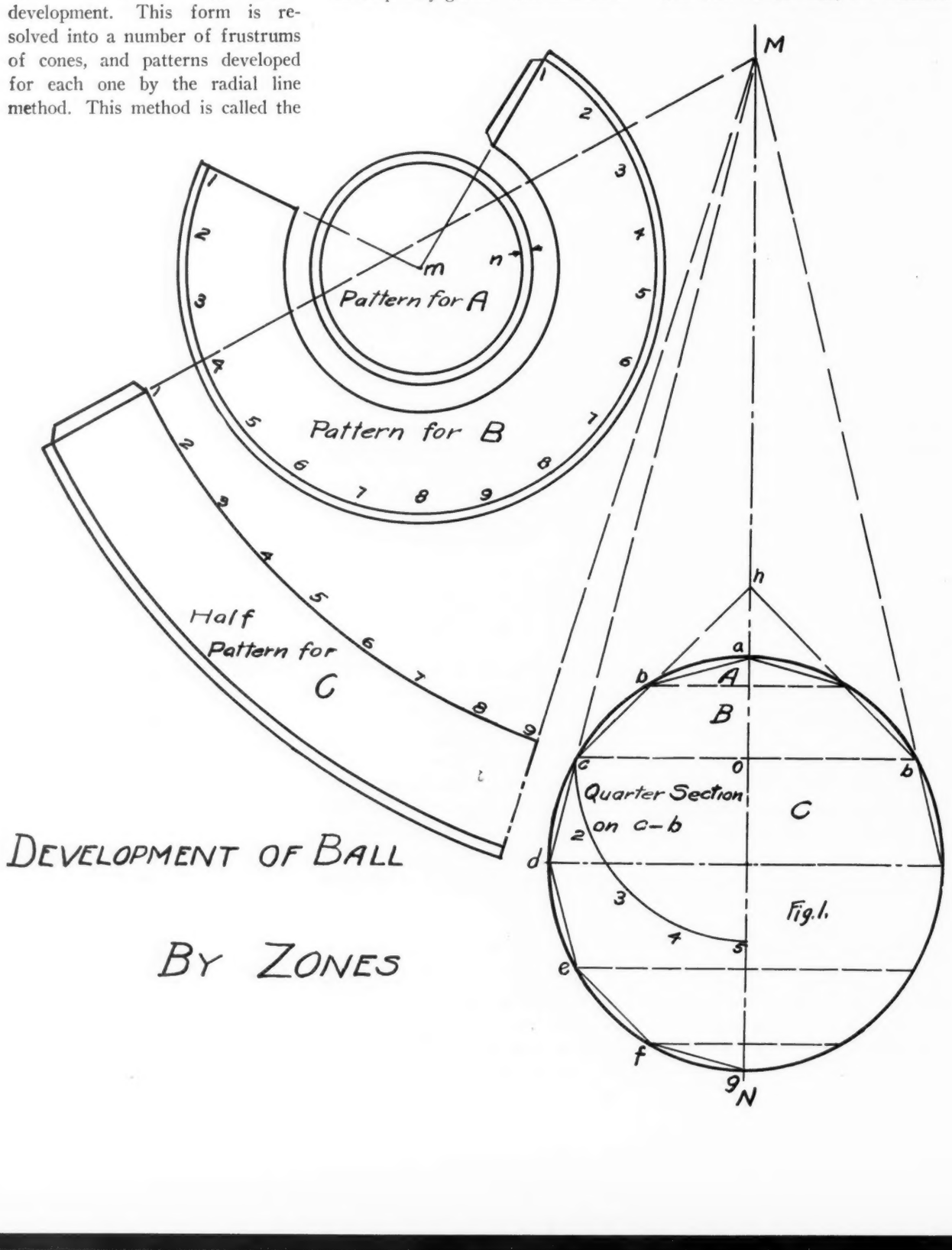
Development of a Ball by Zones

For V. F. Gallagher, Jamestown, N. D.

By **L. F. HYATT**
Contributing Editor

THIS problem was submitted by an ARTISAN reader of Jamestown, North Dakota. The sphere is an example of the most common of a great many forms which admit of approximate development. This form is resolved into a number of frustrums of cones, and patterns developed for each one by the radial line method. This method is called the development by zones, while another method sometimes used is to develop it by gores. This method is more difficult and is more apt to warp, and the process of raising the gores is more difficult than the raising of the zones.

In Figure 1 is shown the elevation view of the ball, the diameter



of which is the required diameter of the ball. With the dividers divide the circumference into 12 equal parts, as shown by the letters *a, b, c, d,* etc. Next connect the points *a-b* with a straight line and with this distance as a radius and point *m* on pattern A as a center, draw the circle representing the blank for the pattern for Zone A, and then draw the circle representing the allowance for the lap, as at *n*. Now with a radius equal to the distance *c-o* on Figure 1 draw the quarter section on line *c-b* and divide and number this quarter section into four equal parts, as shown. Now from point *c* on the circumference draw the straight line through point *b* intersecting the vertical center line *m-n* at point *h*, and with the distance *c-h* as a radius and point *m* of pattern C again as a center draw an arc of indefinite length. Next, using the distance *h-b* as a radius draw another arc of indefinite length representing the inside of the pattern for Zone B. Upon the first arc step off 16 spaces, which represent the circumference of the ball at *c-o-b*. Draw the lines from center *m* to points 1 and add the allowances as shown.

To develop the pattern for Zone C draw a straight line from *d* through point *c*, intersecting the center line *m-n* at *m*. With a radius equal to the distance *m-c* strike an arc of indefinite length and step off the distances 1, 2, 3, 4, etc., found on the quarter section on *c-b*. To conserve space, only a half pattern has been developed. There will be 16 spaces, or four times the number of spaces, on the complete section. Next, with the radius *m-d* strike the arc describing the other side of the zone. Draw laps as shown on half pattern C.

Two pieces of each zone are needed. The ends are soldered or riveted together securely and the raising begun. In this process it is important that the edges should not be stretched any. A template should be made like a quarter of the circle representing the ball and this should be used in testing each gore for accuracy thus avoiding a bumpy ball when completed. Each hemisphere may be assembled by soldering on the inside, and the two hemispheres soldered together on the outside.

Would You Heat This Church Like This?

THE sketch shows the heating system designed to heat a small country church. The reader who laid out the system says he thinks it will work all right, but he would like to know how other readers would plan the system.

Here are the principle factors effecting the design. The building is a frame structure—narrow siding, on paper, on 2 by 4 studs, building paper, wood lath and plaster.

There are twelve windows in the building—five down each side and two windows on either side of the front entrance. These windows are all of the same size—32 inches wide and 6 feet high.

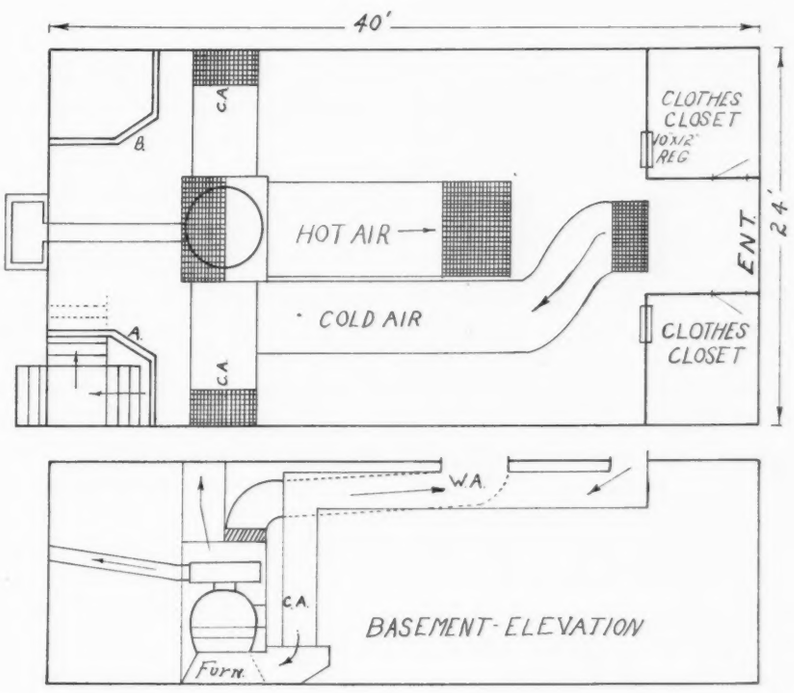
The auditorium is 12 feet high with a flat plaster ceiling on wood lath on roof stringers. Above the lath the joists are open. So is the space under the peak of the roof.

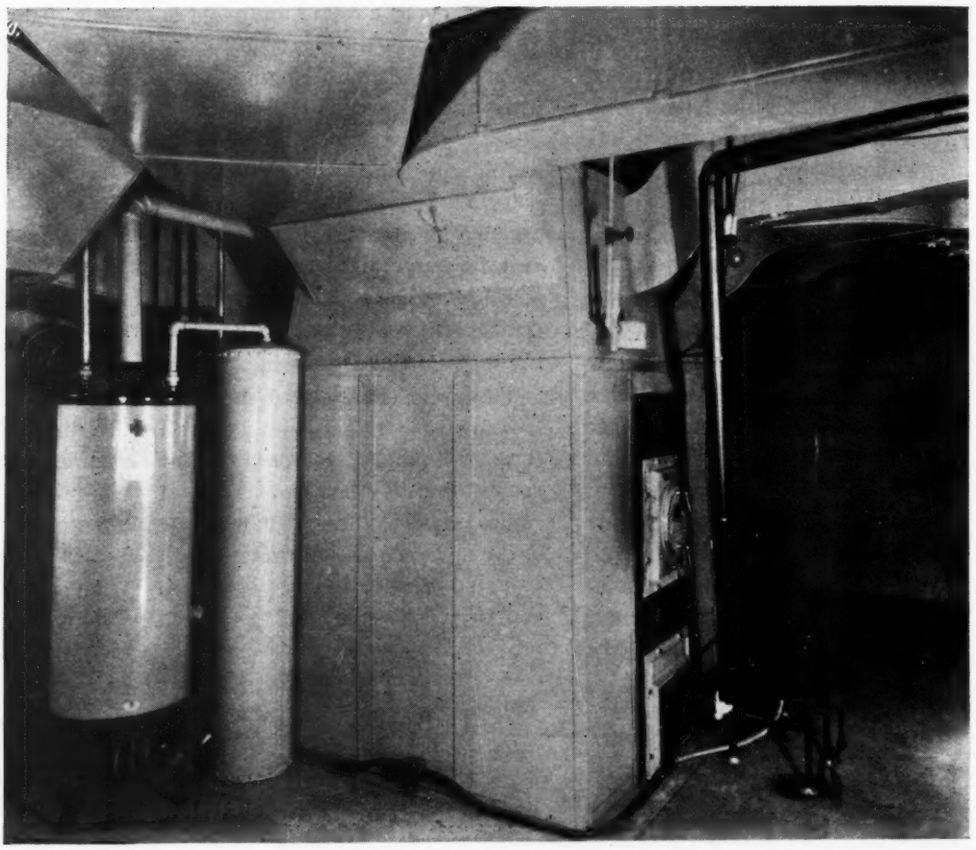
Partitions A and B are 8 feet high and open to the ceiling.

The two cloak rooms are really large closets, full ceiling height partitions with doors and a 10 by 12-inch register to let heat in.

The drawings show how the reader who sent in the problem designed the system. The furnace he selected is a 26-inch fire pot. Both warm air registers are the same size—24 inches by 24 inches. The two side cold air returns are 20-inch round to the shoe and the single return from the entrance is 18-inch.

HOW WOULD YOU HEAT THIS CHURCH IF YOU HAD THE JOB?





Neat, square casing, painted, rectangular ducts, oil burner, automatic controls, low velocities are incorporated in this excellent installation. The system was designed to meet the requirements of an owner who wanted "just the right temperature, just the right humidity, and feared forced air"

Heat, Circulation, Humidity, Cleanliness?

WRITE YOUR OWN TICKET!

OWNERS of many of the finest homes in Minneapolis have learned to appreciate the extraordinary benefits and advantages offered by a properly designed and properly installed heating and air conditioning system. Most of these home owners have been educated to understand how important are health and comfort to their family and to know the distress of winter ills caused by arid, dust-laden, static air.

An excellent example of this situation is the installation of a Waterbury conditioned air system in a wonderful new home served with air at "just the right temperature" and "just the right humidity"—but you can't feel it enter, and you can't feel it leave—it's just there.

Tangible results are unquestionably the most important factors, bringing joy and satisfaction to the heart of the buyer. After all, what does he want? After he gets it, what has he bought? Isn't it comfort? The buyer of this installation was pleased because he got exactly what he wanted.

The owner was afraid of the words "Forced Air." To him they meant "Wind," swishing noises and perceptible air movement around corners, streaked walls, and a general disagreeable condition caused by the presence of a carrying medium traveling at a high velocity.

This man had to be sold, first of all, on the fact that a gas-tight, dust-tight and leak-proof furnace could be used in his contemplated installation. It was necessary, also, to make him believe that with no source of dirt from the heating unit he would have no trouble from dirt circulation or streaking of walls, and further, the velocities would be such that there would be no disagreeable results of any kind. Finally, it was necessary to prove this to him.

The job is outstanding because of the low velocities used. Requirement figures agree to a reasonable extent with results of tests conducted after the installation was put into operation. These combine to give velocities of about 325 feet per minute through the duct system, and about 225 to 250 feet per minute at the register.

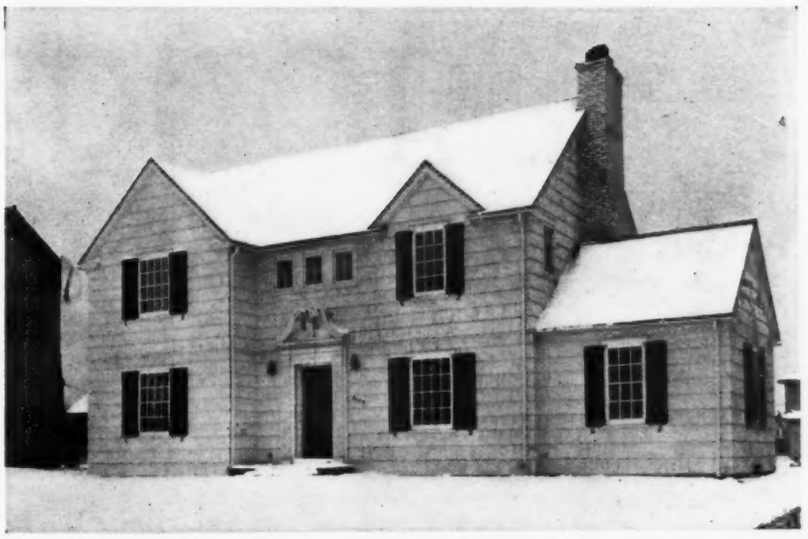
Let's have a look at the building.

The photograph gives a good view of the front of the building which is of strictly modern design, and located in a strictly modern residential district of Minneapolis. The study with its three sides and ceiling of exposure is clearly shown at the right. Double sash are used on all windows.

The basement plan is interesting. The furnace is a 33-inch Waterbury Seamless Special Oil-Burning model equipped with a Marr Oil Burner, thermostatically controlled. The casing is square with a square side-pitch bonnet. Rectangular warm air ducts are run from the furnace as shown. They lie horizontally at the basement joists as soon as possible after leaving the furnace bonnet. Reference to the basement photograph will clearly show how the ducts are connected to hood and run along below the joists.

Duct work is of galvanized iron throughout, slip locked, and firmly strapped to the joists. Volume dampers are used at all intersections and also in the single run to the study. All quadrants are accessible from the furnace room.

The furnace is located in one end of the basement, being as conveniently placed as one could possibly imagine, and yet no duct is visible beyond the furnace room wall, except one which runs through the storage space below the basement stairs. Other pipes and connections are located between joists and above the bearing walls.

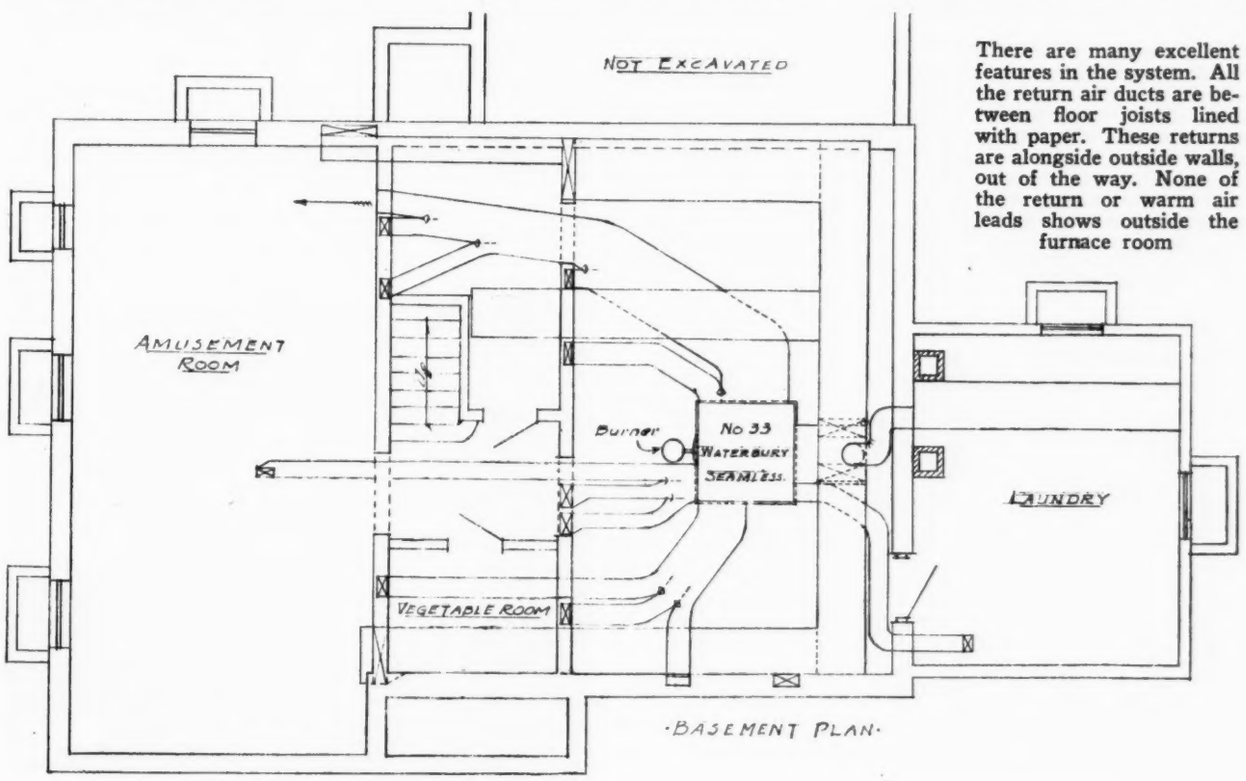


The house is a large, shingle home in Minneapolis where winter means cold weather

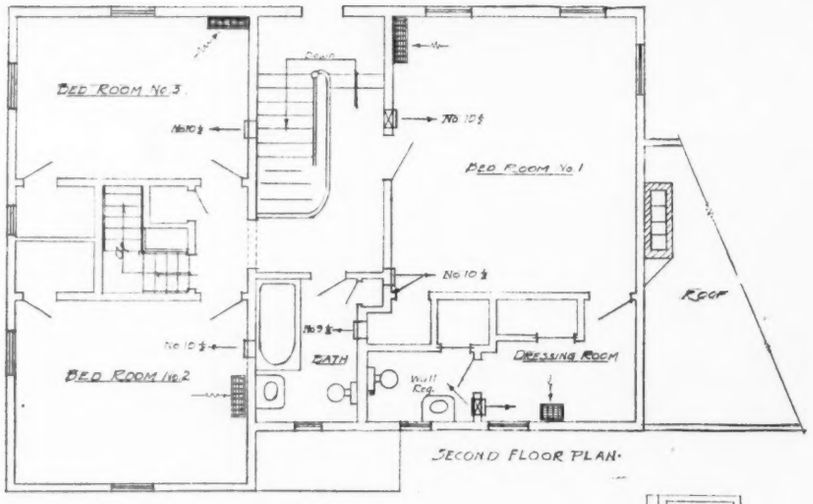
The return air layout in the basement is designed to utilize spaces between joists for all connections to the two boxes running across joists along the rear of the furnace room. The two joist spaces used for return air from the study are connected to the center of the fan housing at the top by means of a 12-inch round pipe. The two rectangular cold air runs elbow down, one connecting to each side of the housing at the top, as shown. Joints between sections of all basement piping are stripped with asbestos paper. All joist spaces are lined with heavy builders' paper.

The fan is a SilentAir, automatically controlled with a furnacestat.

On the first and second floors,



There are many excellent features in the system. All the return air ducts are between floor joists lined with paper. These returns are alongside outside walls, out of the way. None of the return or warm air leads shows outside the furnace room



baseboard registers are used throughout for warm air except in the vestibule and study. The interior photograph gives an excellent view of the neat-appearing register in the living room, which handles this entire room itself.

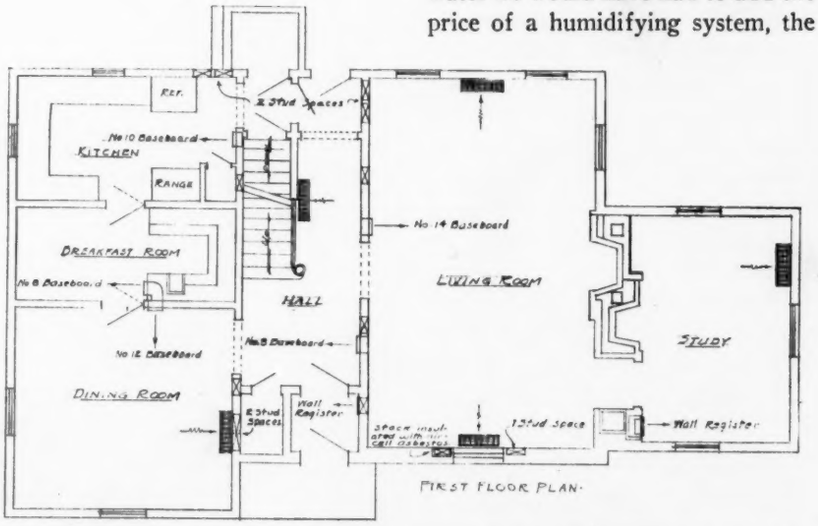
A special construction was used to supply warm air to both dining room and breakfast room through a separate baseboard register in each room.

On the second floor, a 3 by 12 wall stack is run from a No. 10½ baseboard register box to feed a wafer register located about five feet above the floor line in the bath room. A stack of similar size is run to the attic from the No. 10½ box used for heating bedroom No. 1.

There is a wood cold air face in each of the four important second floor rooms. Air from the three bedrooms is brought to the basement in two studding spaces from each room, only one space being used for the dressing room. Each studding space is lined with galvanized iron.

A very good "spacing effect" of the cold air faces was designed for the first floor. Reference to the basement plan will show how the sources of return air were located so as to bring all air into the furnace room, using only the spaces between joists. An excellent symmetry was obtained in the living room by placing a cold air face at each end in the center of the wall.

Excepting in the kitchen, every occupied space in this residence is

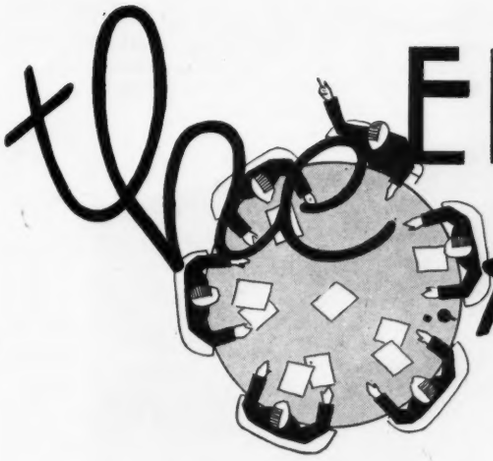


Above are the layouts of the first and second floors. The placement of cold air grilles is particularly effective and neat. Another feature is the general compactness of the warm side with registers grouped to the center of the building

equipped with air inlets and cold air outlets located in such a way as to distribute the air supply as evenly as possible throughout each room at a low velocity, at the same time keeping in mind the items of cost and the useless occupation by heating equipment of otherwise valuable space.

The owner of this house claims that his installation is an outstanding example of economy. He is satisfied that it positively eliminates the drafts and other discomforts he feared. And he is now sold on the idea that the results obtained are gratifying because the air is in motion. This system was installed at a total cost less than a hot water heating system. He now understands that if he had bought hot water he would have had to add the price of a humidifying system, the price of some device to change the air in each room four times per hour and then have the inconvenience of bulky radiators in each room, and the worry of rusting pipes or freezing water.

Every room, except the kitchen, has both inlet and outlet. This assures complete circulation. Here is the living room baseboard register. Its location was carefully chosen so that free circulation is certain and not hampered by furniture



The EDITOR'S Roundtable

Should We Abolish "Factor 55"

I should like to see a discussion which will undoubtedly help some of us to secure a better understanding of the famous factor "55" used in forced air heating calculations.

I believe the factor "55" is wrong! This factor represents the number of cubic feet of air which one B.t.u. will raise one degree; and is used in most of the engineering handbooks and catalogs which tabulate c.f.m. data, etc.

My statement that the factor "55" is in error is based on the following premise:

The amount of heat which one cubic foot of dry air will absorb per degree rise in temperature at 70° F. is .01812. HENCE:—1 ÷ .01812 = 55.2—the number of cubic feet of dry air which one B.t.u. will raise 1° *at 70° F.*

We are, however, concerned with the volume of air in the duct; and this, in a forced air heating system, is 135° F. with a relative humidity of 45%.

The amount of heat which a cubic foot of air will absorb at 135° F. per degree is as follows:

Dry air = .01618
Saturated air = .01675

HENCE:—55 × .01618 + .45 × .01675 = .01645 B.t.u., and is the amount of heat which one cubic foot of air at 135° F. and 45% relative humidity will absorb per degree.

1 ÷ .01645 = 60.8 cu. ft.

in place of the factor "55.2" which we have been using right along.

Another check on this factor is as follows:

At 70° F., weight of *dry* air is .07495 lbs. per cu. ft. Specific heat of *dry* air at 70° equals .2415.

Hence, one B.t.u. will therefore raise:

$$\frac{\text{1 (cu. ft.)}}{\text{.07495 (lbs. per cu. ft.)}} \times \frac{\text{1 (lb.)}}{\text{.2415 (spec. ht.)}} = \text{55.2 cu. ft. per degree}$$

For dry air at 70° F.

But we are concerned with 45% saturated air at 135° F. HENCE:

At 135° F. weight of dry air = .06675 lbs. per cu. ft.
At 135° F. weight of saturated air = .06243 lbs. per cu. ft. (100%)
.55 × .06675 + .45 × .06243 = .06480 lbs. per cu. ft.
at 135° F. and 45% relative humidity.

Specific heat at 45% relative humidity at 135° F. equals .2540. HENCE—one B.t.u. will raise:

$$\frac{1}{.06480} \times \frac{1}{.2540} = \text{60.8 cu. ft. per degree for 45\% saturated air at 135° F.}$$

I appreciate the fact that the temperature of the air entering the fan is 65 or 70°; and the c.f.m. capacity of the fan should, therefore, be based on this temperature, corrected for the proper percentage of relative humidity. In calculating duct sizes, however, we are handling air at 135°; consequently, we should use the proper number of cubic feet of air which one B.t.u. will raise per degree.

The writer contends that it is erroneous to base our air volume calculations on the accepted room temperature value of 70° F. While the amount of heat given up by the air is that dissipated in the temperature drop from 135° to 65°, the actual temperature of the air handled throughout the entire duct system, is 135°. Hence, our duct calculations should be based on this condition.

If my analysis of this situation is in error, I shall be most grateful to you for correcting such error. With best wishes, I remain

(Signed) B. L. SCHWARTZ,
Schwartz Furnace Co., Pittsburgh.

The question which Mr. Schwartz outlines is one which has been discussed spasmodically for some time. It is raised, usually, in attempting to justify smaller supply ducts. Theoretically, factor 55 is erroneous, but the 10 per cent difference may or may not be worth arguing about. We invite your contributions to this discussion.—The Editor.

Corrugated iron and glass form the exterior of this interesting market. This picture shows the wide, inward sloping awning under which shoppers drive their cars.

Corrugated Iron Sheaths Hollywood Market

HOLLYWOOD has the first all-metal open-air public market building in the world, many features of which are attracting attention of architects and builders in all parts of the United States where open markets are practical. The architect, Lloyd Wright of Beverley Hills, is in receipt of letters from various sections of the West and South and other markets of similar construction are being planned at the present time.

Perhaps the most distinctive thing about this Hollywood market, known as the Yucca-Vine market, is the fact that the architect has utilized the directional lines of the corrugations in the metal to give the design and motif without introducing any foreign material.

In this connection attention is called to the great canopy under which the customers drive their automobiles when shopping at the market. An objection to many open markets is the absence of a protective canopy, a condition that makes wet weather shopping unpleasant. The great sheet metal canopy on the market slopes upward from the top of the open front so that the under side rather than the upper side is visible to the person on the ground level. The directional lines of the corrugations converge toward the displayed merchandise thus directing the eye of the customer toward the merchandise.

The corrugations also give the modernistic effect without the need of any other creative design.

The hang-over at the front edge of the canopy—the eaves, so to speak—is not a separate piece of sheet metal but is formed by breaking the metal along a half-sawed line. Not only does this give an eave to the canopy but it breaks the monotony of the directional lines, introduces an angle, and lends variety. Since no foreign material is introduced, the construction cost is kept at the minimum while none of the desired effect is lost.

This market, with its novel and interesting application of a common form of metal, has been highly praised by architects for its style freedom and unusual treatment. The market illustrates the great possibilities of metal in the hands of a skilled architect and contractor.

With specially constructed doors which close at night the building is as near vermin and rat-proof as it is possible to make it. This is a factor which must be considered in the construction of a food market.

The cooler and the base for the Neon signs which extend high above the roof are also of metal, the cooler disks being of plain metal with the sign base of the same corrugated metal as the remainder of the building, the corrugations breaking up the reflected light into low-lights and high-lights thus making it more conspicuous during the day.

How corrugated metal is used on the interior is shown by the flower shop, where the metal interior painted with aluminum paint works

out well in a flower shop, the color of the walls giving the proper background for effective flower displays.

All furniture and fixtures in the flower shop are built of sheet metal. The central pool built for water plants and gold-fish is of poured concrete but the forms were made of the corrugated sheet metal, the exterior form being left in place giving the pool the appearance of sheet metal construction. Plant receptacles one above the other, shelving—practically everything in use for display purposes—are of sheet metal.

Advantages in the use of sheet metal other than those already mentioned, according to Mr. Wright, are economy of construction, low upkeep cost, facility of construction, perfect cleanliness, and small depreciation. The building cost much less than it would have cost built with the usual lath and plaster interior. The first spraying of aluminum paint gave a surface as bright today as the day it was finished. The building can be washed with a hose, the galvanized surface plus the aluminum paint surface giving an exterior finish that can not be damaged by rust or corrosion. To these advantages is that of being absolutely fireproof.

Everything in the inside is corrugated iron. The shelves, pool exterior, window bases, even the ceiling are uncovered metal. Spray applied paint was used for color.

Slightly more than one hundred sixty squares of standard gauge galvanized sheet iron was used. The owner of the building is Richard Griffith, well known moving picture director. The area of the concrete floor is nearly ten thousand feet, the dimensions being 121 feet by 80 feet.

Welding a Soldered Joint at 3200 Degrees F

Although the welding of stainless steel is no longer difficult, an unusual application presented itself recently and its solution offers a possible aid to many others using this comparatively new alloy.

In making an Allegheny Metal food container, a manufacturer wanted to solder the seam on the inside of the tank, also to weld along the outer flange for greater strength. Solder would cover the seam smoothly and prevent food particles from lodging which might decay and contaminate subsequent batches. He found, however, that after the welding operation had been performed, a hard oxide deposit in the seam prevented the solder from adhering. If the process were reversed, the high temperature required for welding (3200 deg. F.) would melt the solder (melting point, 450 deg.).

To avoid the objectionable deposit of oxide, the tank was soldered and partly filled with water before welding. The water served to check the intense welding heat that followed, and prevented the solder from melting.

This solution was worked out by engineers of Joseph T. Ryerson & Son, Inc., and was demonstrated before the Waukegan, Ill., Welding Society recently.

Allegheny Metal Welding Rod and a Type "S" Wilson Welder were used in conducting this test. An Allegheny solder and special flux was supplied for the soldering application.

GRAVITY EXHAUST VENTILATION

Residence Ventilation [Continued]

By **PAUL R. JORDAN***

ATTIC ventilation means cooling. Roof space ventilation may mean getting rid of moisture and the elimination of condensation, but where a roof space is entitled to be called an attic, it is presumably high enough to be free from the moisture problem.

When we speak of an attic we naturally have in mind a residence, so what will be said about attic ventilation will apply particularly to residences. However, the same underlying principles will apply to any kind of attic or even roof space.

Attic ventilation has to do with cooling, but it would probably be more accurate to speak of it as the removal of heat. An unventilated attic is a heat reservoir. This heat is stored up through the day and is released at night to the discomfort of those trying to sleep beneath it.

Anything that will get rid of this heat will contribute greatly to the comfort of those living in a house. If this heat can be constantly withdrawn during the day instead of being stored, that, of course, will contribute to the comfort of the occupants all day long; and lacking this, if the stored heat can be withdrawn shortly after sundown, it will allow the sleeping rooms below to be used with a measure of comfort.

Actually, the cooling of the attic during the day and the relief of stored heat in the evening go hand in hand. Both can be accomplished by proper ventilation.

Most attics are not ventilated at all. Very few of them are properly ventilated. This is probably due to the fact that 100 years ago houses were built for the purpose of keeping us warm—as shelters against cold and rain; and they are still being built the same way. But the heating problem is being rapidly solved, while the cooling problem is still with us, and is actually becoming more acute.

Viewing the matter entirely from the standpoint of logic, it is almost inconceivable that a residence for summer as well as for winter use, should be built with a practically airtight attic, which in itself is an absorbent that will catch and store the sunheat during an entire summer day, holding it there throughout the night to torture the home owner.

It would not be logical to maintain that summer cooling is as important as winter heating or as shelter from rain, but it is a fact that having satisfactorily disposed of the heating and sheltering problems, the most important one left from the standpoint of human comfort is that of cooling in summer. And during a hot, dry summer cooling becomes paramount.

The average person can stand a good deal of heat during the day, if he gets his sleep at night. It is the hot, sleepless night that takes the starch out of him. So, when shown how he can assure himself of a night's rest during hot weather with attic ventilation, he will buy

*The Paul R. Jordan Co., Indianapolis, Indiana.

Modern residence ventilators are inconspicuous

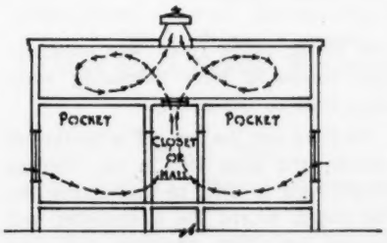
and pay for it. As a matter of fact, he hardly needs to be shown. He is already asking for it and in some cases, demanding it.

The movement of hot air is naturally upward. In any attic the hottest air will be found at the highest point. That point then is the proper place to tap into the heat reservoir. If this hottest air is not withdrawn at the top, it will remain there because hot air does not naturally come down. It will stay there, pressing upward against the roof, until it is forced downward by even hotter air. If the exhaust is not placed at the extreme top, a hot air pocket is left untouched, holding the very hottest of the air.

Cool air naturally hugs the floor. Cool air introduced into the attic will tend to spread out over the floor and cool it, but it does not shield the floor from heat radiated downward from the hot air reservoir above. This radiated heat is a very large factor in sleeping room comfort.

Any degree of attic ventilation is a great deal better than no ventilation at all. If, to an unventilated attic, a person adds any ventilation at all, he is going to notice a difference; but there is nevertheless a right way and a wrong way; and the right way will give much better results than any other way. The right way merely has regard to the principles of air movement and of heat removal.

The right way to ventilate an attic is to bring in cool air at the bottom and remove hot air at the top.



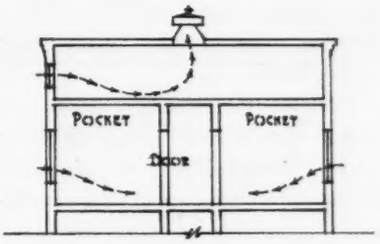
SHOWING HATCH INTAKE

If the house has a center hatch into the attic, this kind of a ventilating system can be installed. All that is necessary for first floor ventilation is to open the hatch

The removing of hot air at the top can be accomplished with a gravity ventilator very satisfactorily on an ordinary residence. This ventilator should be installed at the high point of the roof, or if for any reason it cannot be so installed, it should be installed as high as possible. If a roof is so constructed as to give several pockets which will not drain into a common center from their highest points, then the best results will be obtained by the use of several ventilators, so placed as to tap into each pocket at its high point.

In bringing in colder air, it is quite important that this be brought in at the floor line of the attic. Distribution in this case is of secondary importance, as the tendency for cool air to spread out over the floor will make for proper distribution. If louvres have to be installed for intake purposes, they should be installed at the floor line of the attic and in such a position as to give as good distribution as possible. It is seldom, however, that louvres need to be installed.

Attic windows make reasonably good intakes, but an open stairway or hatch is much better than either attic windows or louvres because it serves the double purpose of introducing cool air into the attic and of withdrawing warm air from the house below. One of the illustrations shows air coming from the house as warm air, while the same air coming into the attic is called cool air. The terms, of course, are relative, the warmest air coming from the house being cooler than the coolest air in the attic. This same air taken from the house relieves the interior of heat, and flowing through the attic actually cools the attic; or at least it brings down the attic temperature.



SHOWING WINDOW INTAKE

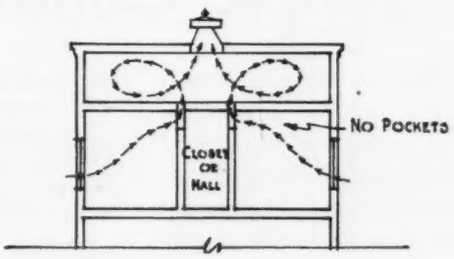
Straight attic ventilation can be obtained by placing a ventilator at the roof peak and opening the windows to get an in-draft

An intake even better than either an open stairway or a hatch is a register set in the ceiling, or in the wall at the ceiling, of the room below. Such an intake, tapping into the hot ceiling space of each room underneath the attic, will afford a great amount of relief from heat. The ceiling register is better from a standpoint of cooling, but has the objection of allowing dust to settle from the attic into the room below, unless provision is made to shield it.

The space between the studding may be utilized for a flue in case the ceiling register at the ceiling is used, but it must be made certain that no plates or construction joists can block free access into the attic. Dampered registers should be used in order to conserve heat.

The roof ventilator also should be dampered. In an unused attic with a hatch instead of a stairway, the

Continuous operation during the summer time can be obtained with this type of system. The high side wall grilles pull the hottest air out of the room. The grilles can be dampered in winter



SHOWING ATTIC VENTILATION COUPLED WITH SLEEPING ROOM VENTILATION

damper can be operated with a chain or rope coming through or to the hatch.

Perhaps the greatest sales resistance to be met in the marketing of attic ventilation is the objection to the appearance of a roof ventilator. Apparently its height above the top of the roof is the most objectionable feature. Also there is the objection of anything like a barn or factory type ventilator being used on a residence. It is desirable to have the ventilators set as low as possible. It is also desirable to use a square base. Furthermore, if a ventilator base different in appearance from the plain round, square to round or cupola type base is used, it will be more attractive to the home owner.

Insulation used in connection with ventilation will help, but is not as important as ventilation, because insulation without ventilation is not 100 per cent effective. However, insulation added to ventilation has a distinct value. In my opinion it is better to apply insulation at the floor line of the attic than at the ceiling of the attic, because applied at the floor line it will be somewhat more effective for heat conservation in winter and just as effective an insulator against heat during the summer. Of course, I am referring to the unheated attic, and not to one that is heated and used the same as part of the house.

It is remarkable what a nominal amount of attic ventilation will accomplish in the way of comfort. My experience with home owners who have installed attic ventilation has been rather amusing, in that almost invariably they put the reduction in temperature at about 25 degrees. As a matter of fact, the actual reduction as indicated on a thermometer would not be anything like that much, but the degree of comfort attained is very definite, because of the elimination of radiant heat, which does not show on a thermometer.

Attic ventilation is very important and is easily sold during hot weather. It is within the means of every home owner, so that the market for it is unlimited.

Simple Control for Furnace Fan

The articles on fan control wiring and the problem of selecting the proper setting for the control brought a number of letters indicating that this problem is by no means finally settled in the minds of contractors.

For example, the letter below raises the point that combinations of controls can be varied to meet specific installation conditions. What has been your experience with this problem?

AMERICAN ARTISAN,
Chicago, Ill.

Gentlemen:

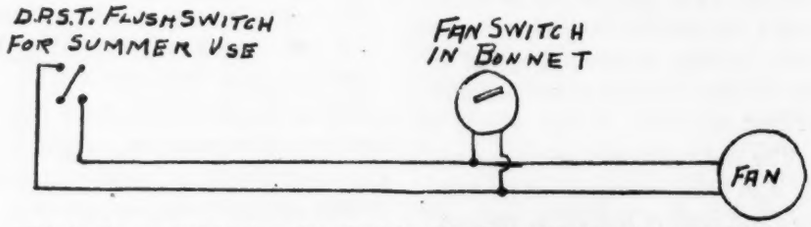
The articles you are running on Fan Control Wiring are very interesting.

We are using a simpler hookup for summer cooling than any I have seen published. We are using a Bonnet thermostat with a mercury switch. For summer control we install a 10 ampere double pole flush type electric switch at a convenient point upstairs. This switch is wired so as to close the fan circuit and is connected ahead of the mercury switch. This gives a double control of the fan—a temperature control during the heating season and a manual control for cooling.

We use a double pole switch wired as a single pole double break switch. This reduces the arc and consequently the burning of the switch contacts when breaking the circuit.

We found that the contacts on an ordinary single pole switch soon burned so badly that the switih had to be replaced.

As to the method of fan control, I believe that both the type of equipment used and the special conditions to be met in a particular job will decide that.



This is the control hookup described by Mr. Geer. The fan is controlled by the bonnet stat and not by the house thermostat

We recently had a large residence job in which we used a steel furnace, a blower without bypass louvers and a dry type filter. An oil burner was to be installed by the manufacturer. Our problem was to decide whether to cut the fan off when the oil burner went off, or to allow the fan to run until the bonnet temperature was reduced to the point of blowing cold air.

In the estimation of the owner, the most important room in the house was the nursery. It was an upstairs room at the far end of the longest duct. To further complicate matters, the oil burner man installed the room thermostat in the living room, almost directly over the furnace.

We controlled the fan entirely by the heat in the bonnet, setting the fan switch to cut in as soon as warm air would be delivered to the registers, and allowing the fan to run as long as heat was left in the bonnet. Any overide in the living room was unimportant compared with delivering sufficient heat to the nursery.

Had we cut the fan off with the oil burner, the heat left in the furnace would tend to drift to the nearby living room, where the thermostat was located and thus postpone the time when the thermostat would again call for heat. In the meantime the nursery would be too cold for comfort.

Yours truly,

[Signed] F. H. GEER,
Sunbeam Heating & Ventilating Co., Chicago.

CAN YOU TELL ME ?

Stokers

From Julius Nicoll, Harrisburg, Pennsylvania.

Who manufactures stokers?

Ans.—Brownell Company, Dayton, Ohio; Combustioneer, Inc., Goshen, Indiana; Domestic Stoker Company, 7 Dey Street, New York City; Fire-King Stoker Company, 1160 Roosevelt Road, Indianapolis, Indiana; Germer Stove Company, Erie, Pennsylvania; Illinois Stoker Company, Alton, Illinois; Iron Fireman Manufacturing Company, 3170 West 106th Street, Cleveland, Ohio; Motor Stoker Corporation, 250 Park Avenue, New York City; Parry Stoker Company, Cincinnati, Ohio.

✦

Tubing for Aeroplane Frame Work

From Joe Wood, Anderson, Indiana.

Where can I get ⅜-inch to 1-inch tubing, the kind used in building aeroplane frame work?

Ans.: Steel & Tubes, Inc., 122 South Michigan Avenue; Edgar T. Ward Sons Company, 4843 South St. Louis Avenue; both of Chicago, Illinois.

✦

Bi-Metal Metal

From Baker Furnace Company, Toledo, Ohio.

Where can we get Bi-Metal metal, used in the manufacture of thermostats?

Ans.: A. C. Blancke & Company, 217 North Des Plaines Street, Chicago, Illinois; W. M. Chace Valve Company, 1600 Beard Avenue, Detroit, Michigan; The H. A. Wilson Company, 97 Chestnut Street, Newark, New Jersey.

✦

Metal Tile

From Roy B. Larson, Bloomington, Illinois.

From Walter H. Ziegler, Farmland, Indiana.

Where can I get metal tile for bathrooms, kitchens, etc.?

Ans.: The Duratile Company, Mishawaka, Indiana; The Erie Enameling Company, Erie, Pennsylvania; Porcelain Tile Company, 228 North LaSalle Street, Chicago, Illinois.

Stainless Flux

From Bay City Roofing Company, Bay City, Michigan.

Where can we get stainless flux?

Ans.: L. B. Allen Company, Inc., 6727 Bryn Mawr Avenue, Chicago, Illinois; Kester Solder Company, Inc. 4241 Wrightwood Avenue, Chicago, Illinois.

✦

Sheet Metal Tile

From Arlie E. Roberts, Greybull, Wyoming.

Where can I get sheet metal tile for bathrooms?

Ans.—The Duratile Company, Mishawaka, Indiana; The Erie Enameling Company, Erie, Pennsylvania; Porce-

✦

Heavy Copper and Brass Strainer Cloth

From The Koeberle-Heyer Company, Inc., Sumner, Iowa.

Who makes heavy strainer cloth of copper and brass?

Ans.: Michigan Wire Goods Company, 2100 Howard Street, Detroit, Michigan; The W. S. Tyler Company, 310 South Michigan Avenue, Chicago, Illinois, and Cambridge Wire Cloth Company, Cambridge, Maryland.

✦

Torch for Heating Asphalt Kettles

From William F. McCormick, York, Nebraska.

Who makes a large torch for heating asphalt kettle and also the complete unit built on trailers?

Ans.: Aeroil Burner Company, Inc., 176 North Wacker Drive, Chicago, and Littleford Brothers, 430 East Pearl Street, Cincinnati, Ohio.

✦

Aluminum Fan Blades

From H. S. Basow, Bryn Mawr, Pennsylvania.

Who makes aluminum fan blades in the vicinity of Newark, New Jersey?

Ans.: Ilg Electric Ventilating Company, 15 Park Row, New York City, and B. F. Sturtevant Company, Hyde Park, Boston, Massachusetts.

Information on Oil Burners

From Lang and Lang, Richmond Hills, L. I.

Where may we obtain information on oil burners?

Ans.: American Oil Burner Association, 342 Madison Avenue, New York.

✦

Address of Equipment Supply Company

From I. C. Vanasdal, Attica, Ohio.

Where is the Equipment Supply Company located?

Ans.: 542 West Washington Boulevard, Chicago, Illinois.

✦

Electroplating Supplies

From El Paso Sheet Metal Works, El Paso, Texas.

Where can we get electroplating supplies?

Ans.: Hanson-Van Winkle-Munning Company, 2920 Carroll Avenue; Belke Manufacturing Company, 321 South California Avenue; both of Chicago, Illinois.

✦

Sink Strainers

From S. B. Ford, Jennings, Louisiana.

Where can I get sink strainers?

Ans.: American Foundry & Manufacturing Company, Tenth and Wright, St. Louis, Missouri; Modern Iron Works, 520 South Fifth Street, Quincy, Illinois; Washburn Company, Andrews Division, 1800 Preston, Rockford, Illinois.

✦

Tea Table Casters

From Mabel F. Russell, Lake Weir, Florida.

Where can I get 2-inch casters for a tea table?

Ans.: The Colson-Chicago Company, 235 West Randolph Street, Chicago, Illinois.

✦

Chrome Plated Zinc

From The Farber Co., Pawtucket, R. I.

Who manufactures chrome plated zinc, plated on one side and polished?

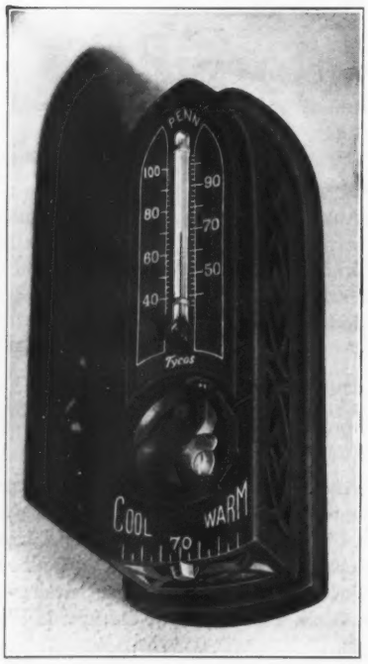
Ans.: Apollo Metal Works, LaSalle, Ill.; American Nickeloid Co., Peru, Ill.

New PRODUCTS

Penn Electric Switch Co. to Introduce New Thermostat

After more than eighteen months of research, the Penn Electric Switch Co., Des Moines, Iowa, will soon begin manufacture of a new thermostat to be known as Type C. It will be an addition to their present line of room controls.

The new Tyce C thermostat is a beautifully proportioned instrument, unusually compact and small, 4¾ inches high, fash-



ioned along Gothic style by the nationally known cathedral designer, Leonard DeWitt of Chicago, in conjunction with several other well known artists.

The base and cover are made of moulded bakelite, finished in several colors to harmonize with the surroundings of the home. The standard color, however, is a rich walnut brown. The cover has been not only artistically designed, but scientifically, to permit a free circulation of air and assure sensitive operation of the thermostat. The total differential is actually less than 1½ degrees.

Complete specifications and prices may be secured by writing the Penn Electric Switch Co., Des Moines, Iowa.

Automatic Humidifier Co. Combination Furnace Control

The Automatic Humidifier Company, Cedar Falls, Iowa, announce a new combination furnace control. The purpose of the unit is to regulate the operation of the furnace by maintaining control of draft regardless of how this draft is set.

There is a contracting and expanding section in the unit which opens and shuts the draft. Temperatures in the furnace can be controlled by pulling the draft open wider with a hand chain. Regardless of how wide open the draft is set with the chain, the expanding section will shut the draft when this temperature is reached.

The unit is designed to sell for $18, installed.

A description of the new product is contained in a small leaflet which can be obtained by writing the company.

New Steel Furnace Announced by New Company

A new boiler plate furnace for homes, involving advantages in construction and price, is soon to be offered the trade by the Michigan Tank & Galvanizing Co., 14101 Prairie Avenue, Detroit.

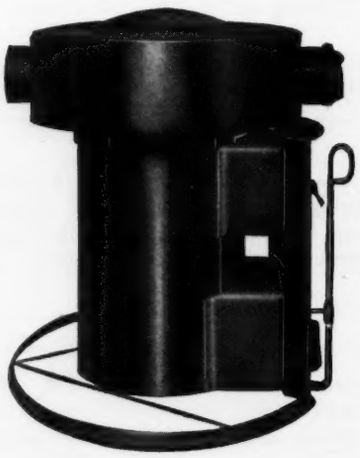
This company, since 1922, has been manufacturing steel storage tanks, tanks for trucks, galvanized range boilers, low pressure steam boilers and steel plate products. Attracted by the future possibilities in the steel furnace field, a heater division has lately been organized. The new furnace will be called the Cheviron, named after the president of the company, J. J. Cheviron. It will be of conventional design and offered for use with coal, gas, oil and air conditioning set-ups. One quality-grade only will be manufactured in six sizes.

Sales of the new outfit will be under the direction of P. H. Hammond, until lately president of the Armstrong Furnace Company, Columbus, Ohio. Otto Thiel, until recently connected with the Silent Automatic Burner Corporation of Detroit, is the engineer responsible for the design of the heater and he will be available for advisory service on any heating problems.

U. S. Pressed Steel Company Announces a New Steel Furnace

U. S. Pressed Steel Company, Kalamazoo, Mich., announces a new steel furnace said to possess several new and improved features.

Among these features are a reversible return flue radiator of open hearth steel which is claimed to be absolutely immune



to warping or breaking troubles. This radiator can be turned end for end to obtain three lengths of fire travel. By setting the radiator in position 1 with a damper the fire is compelled to travel completely around the radiator. In position number 2 fire travel is out the front and to the back in two streams. In position 3 a direct opening to the flue is secured.

The new furnace is so designed that ash pit, fire pot and combustion chamber are all contained in a single steel drum lined with fire brick. The heavy steel radiator sets in a nipple type joint with bolting lugs. Packing, cement and gaskets are not required. The feed pouch and ash pit door are welded to this lower tank.

A full description of the new unit is contained in a leaflet which will be mailed to any contractor requesting it.

News Items

Air Conditioning to Be Exhibited at Century of Progress

How the average family may be provided with a better place to live at less cost; how all the furnishings, decorations and equipment that go into their homes can be made more attractive; how the most scientific appliances for reducing the housewife's labor can be furnished; how by means of modern heating and air conditioning the home can be made more livable both in winter and summer—these and scores of other things of vital interet to American families will be demonstrated in the Home and Industrial Arts Show of A Century of Progress Exposition—Chicago's 1933 World's Fair.

Plans are for eight modern homes demonstrating the uses of new materials and methods of construction. Already arrangements for the construction of four of the homes have been made.

Different housing problems which face different types of families will be dealt with in these dwellings. The task will be to see what can be done to provide better homes for less money for the majority of the people. Inside these houses everything that is new in decorative treatment, furnishing and equipment will be displayed by the makers of these products. The most recent developments in kitchen planning and devices, *refrigeration, heating,* plumbing, *air conditioning,* will be demonstrated—all in keeping with the theme and purpose of the particular home.

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Recommend Destruction of Contract Brokerage

Ingot Iron Shop News in a recent issue carried as its leading editorial a strong condemnation of the prevailing practice of contract brokerage.

The Armco Distributors Association, sponsors of the *News,* declare:

"A few days ago a prominent Ohio ventilating contractor had his first experience with a building contract broker. One of these brokers operates as follow: He secures a contract through political pull, at a fair price, then he tricks the legitimate contract into lowering his bid. Even contractors of insight and long experience are often taken in by the glib, plausible profiteers of the building trade. Here is an illustration of the way he works. He approaches Contractor 'A' and informs him that the bid he submitted on the ventilating duct work is high, by $700. Unless Contractor 'A' cuts his bid to a level with Contractor 'B,' his competitor, Mr. Broker, will be compelled to award the contract to the low bidder. But he really doesn't want to do 'A's' ability, and believes he could do a more workmanlike job. Won't Contractor 'A' reconsider his quotation, meet the pressing competition, and take this work that quite obviousl he needs so badly?

"In a foolish and ill-considered moment, and without considering his cost sheets as he should, Contractor 'A' surrenders. He cuts his bid down—cuts through profit and into loss; cuts out the good materials that he fully intended to use and substitutes cheap materials; skimps on construction, and draws from his own personal account to make up the deficit.

"Who got this $700 that represents the difference between profit and loss? Mr. Profittering Broker. For Contractor 'A,' the victim, had been the low bidder all the while. Actually, Contractor 'B's' quotation had exceeded Contractor 'A's' by more than $20."

Cooling with Basement Air

(*Continued from page* 31)

— we would have, theoretically, 9,000 divided by 1,500 equals 6 minutes of cooling. But we know that the air in the basement must be replaced by air from the outside or recirculated from the floors above and this air will be 10 to 20 degrees warmer than 70. A mixture of air at these temperatures is bound to occur a few seconds after the fan is started.

If the owner goes to the expense of installing the false inner walls and floor and lets the contractor connect the necessary duct work to pass the air from upstairs evenly through this space, the actual cooling ability would be as follows:

There are 19,275 B.t.u.'s of heat which must be taken out of the air every hour to maintain a 15-degree temperature drop. The cold walls and floor can only extract 5,409 B.t.u.'s per hour. The difference—13,866 B.t.u.'s indicates how far short of cooling such a system falls.

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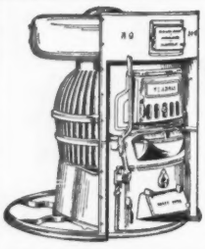
Lakeside Company Holds Salesmen's Group Meeting

Salesmen of the Lakeside Company, manufacturers of blowers, washers, filters, humidifying devices, located in territories within one night's ride of Chicago, gathered in the Sherman Hotel, Chicago, for three days during the first week in March, to discuss sales problems and present business conditions.

A complete program with some outside speakers was prepared for the men. On the first day Platte Overton, Engineering Editor of AMERICAN ARTISAN, spoke on residential air conditioning; how to sell it, how present problems can be handled. Following the talk a discussion of the whole field of domestic air conditioning thrashed out many of the design, installation and selling problems.

Significant of the men's attitude were several statements to the effect that the present depressed market cannot long continue and that improved conditions are waiting only for some indication of easier money, slight improvements in general business or improved employment.

Ira Rowell, Secretary and Treasurer, stated that such meetings emphasized how widely different are the problems of selling, even within one organization, and that such gatherings go a long way to cement the "family" feeling. Such meetings are well worth while.



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News Items . . . . .

Midyear Warm Air Meeting to Be of Profitable Value to All Industry

Preparations are well under way for the Midyear Convention of the National Warm Air Heating Association which is to be held in the Deshler Wallick Hotel, Columbus, Ohio, May 18 and 19.

The Program Committee states the subjects presented will be of practical help and will relate to the commercial, merchandising, manufacturing and engineering phases of the industry. One valuable feature will be the first report by the Research Staff from their new work since December 1 in forced air and some other forms of air conditioning. Much helpful information on these subjects is promised. The entire program will be arranged so as to permit discussion and questions. May 17 will be devoted to meeting of the Association Board of Directors and various standing committees.

A delightful banquet will occupy the evening of May 18.

Arrangements have been made for special railroad rates under the certificate plan.

Everyone interested in warm air heating is invited to attend and assured of a cordial welcome.

✦

Ampeco Announces Reorganization Changes

American Machine Products Company, Marshalltown, Iowa, manufacturers of Ampeco blowers and air washers. announce changes in official personnel, effective as of the last stockholders' meeting.

At this meeting Merritt Greene was elected President; James Jensen elected General Manager, Secretary and Treasurer.

✦

Motor Wheel Corp. Adds New Men to Field Staff

Partly to augment their present intensive sales campaign, and in order to give present dealers better contact service, Motor Wheel Corporation, Heater Division, has just placed three additional men in three different territories to act as district representatives for M-W Oil Burning Utilities.

These men are R. R. Wallace, R. W. Knee and V. C. Page. Mr. Wallace will act as district manager for the states of Iowa and Nebraska. Mr. Knee will have jurisdiction over Indiana, Ohio and Kentucky; while Mr. Page, located in Philadelphia, will travel the Philadelphia territory and southern New Jersey.

✦

Coming Conventions . .

Sheet Metal Contractors' Association of Illinois—April 6 and 7, at Pere Marquette Hotel, Peoria, Ill. Secretary, Clarence Nelson, 1008 South Adams Street, Peoria, Ill.

American Oil Burner Association—April 11 to 16, at Boston, Mass. Headquarters for convention, Hotel Statler, Boston. Secretary, H. F. Trapp, 342 Madison Avenue, New York City.

National Warm Air Heating Association—May 18 and 19, at Deshler-Wallick Hotel, Columbus, Ohio. Secretary, Allen W. Williams, 3440 A. I. U. Building, Columbus, Ohio.

New Literature . . . .

Ilg Has New Literature on Ventilation Applications

Ilg Electric Ventilating Company, 2850 North Crawford Avenue, Chicago, has ready for ventilation contractors a new catalog describing and showing typical applications of fans to the needs of the home owner and various industries. Included in the text are chapters devoted to such special applications as garages, stores, restaurants, homes and shops. Other sections discuss special applications of fans to the needs of industry.

The catalog is thoroughly illustrated with photographs and drawings. Full tables and information on the fans used in all these special applications are also given.

The Ilg company has also issued two leaflets of interest—one explains the new portable cooler which can be moved from room to room and which used ice as the cooling agent. The other leaflet deals with residential attic ventilation.

All three of these catalogs may be had by writing the manufacturer.

✦

Range Folder Released by Motor Wheel Corp., Heater Division

"Cook with Oil and Fuel Bills Will Go Down" is the title of a new comprehensive and illustrated six-page folder just released by the Heater Division of Motor Wheel Corporation of Lansing, Michigan.

The release of this new piece of literature follows Motor Wheel Corporation's recent announcement of a complete new line of commercial oil burning range units.

The folder is attractively printed in colors on six large pages in which illustrations, general descriptive data and complete specifications play an important part.

Upon writing the manufacturer, those interested may obtain copies of this new folder at no obligation.

✦

Kleenaire Issues New Catalogue on Line of Filters

Kleenaire Filter Company, Stevens Point, Wisconsin, have issued Bulletin D1, describing the various types of filters manufactured. The leaflet also announce the new unit "Series B Filter."

The bulletin shows magnified photographs of filter construction and charts indicating the efficiency of the two types—A and B. Complete discussions of the construction of the filters and information on operation are given in the leaflet.

Copies of the bulletin may be secured from the manufacturer.

✦

Niagara Machine & Tool Works Slip Roll Forming Machine Catalogue

Niagara Machine & Tool Works, Buffalo, N. Y., have issued a new bulletin, number 77, describing the company's line of slip roll forming machines.

The catalogue describes all types of machines from bench type hand operated units to 96-inch power units. In between these two extremes are a number of units of varying sizes using both hand and motor power.

The units are shown by photograph, with complete descriptions of the units given, also tables of sizes and capacities.

Contractors interested in new machinery can secure copies of the bulletin from the company.

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A furnace backed by experience gained over a period of 52 years of furnace manufacture and constructed to efficiently and fully meet the most exacting needs of the industry.

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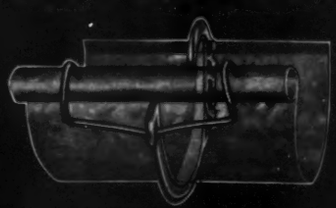

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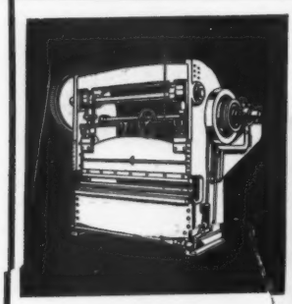

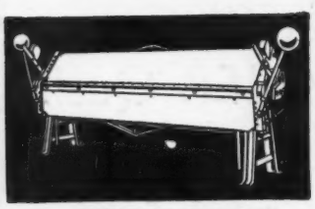

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American Fdy. & Furnace Co., Bloomington, Ill.

AIR WASHERS
A. Gehri & Co., Tacoma, Wash.
Health Air Systems, Ann Arbor, Mich.
Hess Warming & Vent. Co., Chicago, Ill.

ASBESTOS COVERING AND PAPER
Standard Asbestos Co. of Chicago, Chicago, Ill.

ASH SIFTER
Diener Mfg. Co., G. W., Chicago, Ill.

BLAST GATES
Berger Bros. Co., Philadelphia, Pa.

BLOWERS
American Fdry. & Furnace Co., Bloomington, Ill.
Foret-Air Co., Rockford, Ill.
A. Gehri & Co., Tacoma, Wash.
Health-Air Systems, Ann Arbor, Mich.
Hess Warming & Vent. Co., Chicago, Ill.
Henry Furnace & Fdy. Co., Cleveland, Ohio

BRAKES—BENDING
Dreis & Krump Mfg. Co., Chicago, Ill.
Interstate Machinery Co., Chicago, Ill.

BRAKES—CORNICE
Dreis & Krump Mfg. Co., Chicago, Ill.

BRASS AND COPPER
American Brass Co., Waterbury, Conn.
Revere Copper and Brass, Inc., Rome, N. Y.

CANS—GARBAGE
Diener Mfg. Co., G. W., Chicago, Ill.

CASTINGS—MALLEABLE
Fanner Mfg. Co., Cleveland Ohio

CEILINGS—METAL
Globe Iron Roofing and Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

CEMENT—FURNACE
Lastik Products Corp., Pittsburgh, Pa.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

CEMENT—ROOFING
Lastik Products Corp., Pittsburgh, Pa.

CHAIN—FURNACE
Hart & Cooley Mfg. Co., Chicago, Ill.

CHAPLETS
Fanner Mfg. Co., Cleveland, Ohio

CLEANERS—FURNACE VACUUM
Breuer Elec. Mfg. Co., Chicago, Ill.
Brillion Furnace Co., Brillion, Wis.
Densmore & Quinlan Co., Kenosha, Wis.
National Super Service Co., Toledo, Ohio

CONDUCTOR ELBOWS AND SHOES
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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Berger Bros. Co., Philadelphia, Pa.
Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
David Levow, New York, N. Y.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Rival Strap Corp., New York, N. Y.

CONDUCTOR PIPE
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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Hart & Cooley Mfg. Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Parker-Kalon Corp., New York, N. Y.
Young Ventilating Co., Cleveland, Ohio

DAMPPROOFINGS
Lastik Products Corp., Pittsburgh, Pa.

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Aeolus Dickinson, Chicago, Ill.

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Parker-Kalon Corp., New York

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Berger Bros. Co., Philadelphia, Pa.
Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

FANS—FURNACE
A-C Mfg. Co., Pontiac, Ill.
American Fdy. & Furnace Co., Bloomington, Ill.
A. Gehri & Co., Tacoma, Wash.

FILTERS—FURNACE
American Air Filter Co., Inc. Louisville, Ky.
A. Gehri & Co., Tacoma, Wash.

FLUXES—SOLDERING
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FORMING ROLLS
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Interstate Machinery Co., Chicago, Ill.

BUYERS' GUIDE

FURNACE CLEANERS
(See Cleaners—Furnace Vacuum)

FURNACES FOR GAS OR OIL
Dail Steel Products Co., Lansing, Mich.
Health-Air Systems, Ann Arbor, Mich.

FURNACES—GAS
American Fdy. and Furnace Co., Bloomington, Ill.
Henry Furnace & Foundry Co., Cleveland, Ohio
Lennox Furnace Co., Marshalltown, Iowa
Meyer Furnace Co., Peoria, Ill.
Payne Furnace and Supply Co., Beverly Hills, Calif.
Round Oak Furnace Co., Dowagiac, Mich.

FURNACES—GAS AUXILIARY
Forest City Foundries Co., Cleveland, Ohio

FURNACES—OIL BURNING
Motor Wheel Corp., Heater Div., Lansing, Mich.

FURNACES—WARM AIR
(See Also Unit Air Conditioners)
Agricola Furnace Co., Gadsden, Ala.
American Fdy. & Furnace Co., Bloomington, Ill.
Andes Range & Furnace Corp., Geneva, N. Y.
Brillion Furnace Co., Brillion, Wis.
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Health-Air Systems, Ann Arbor, Mich.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Hess Warming & Vent. Co., Chicago, Ill.
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Liberty Foundry Co., St. Louis, Mo.
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Meyer Furnace Co., The, Peoria, Ill.
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Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.
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Harrington & King Perforating Co., Chicago, Ill.
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Independent Register & Mfg. Co., Cleveland, Ohio

GUARDS—MACHINE AND BELT
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Harrington & King Perforating Co., Chicago, Ill.

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Fanner Mfg. Co., Cleveland, Ohio

HANDLES—SOLDERING IRON
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Motor Wheel Corp., Heater Div., Lansing, Mich
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.
Payne Furnace & Supply Co., Beverly Hills, Calif.
Waterman-Waterbury Co., Minneapolis, Minn.

HEATERS—SCHOOL ROOM
Meyer Furnace Co., The, Peoria, Ill.
Waterman-Waterbury Co., Minneapolis, Minn.

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Automatic Humidifier Co., Cedar Falls, Iowa
Clarm Mechanical Devices Co., Lima, Ohio
Columbus Humidifier Co., Columbus, Ohio
Diener Mfg. Co., G. W., Chicago, Ill.
Hess Warming & Vent. Co., Chicago, Ill.
Meyer & Bro. Co., F., Peoria, Ill.
Sallada Mfg. Co., Minneapolis, Minn.

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Apex Regulator Co., Marshalltown, Ia.

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Harrington & King Perforating Co., Chicago, Ill.

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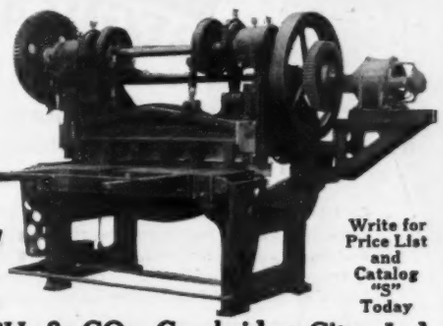

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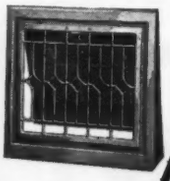

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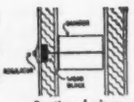

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Hart & Cooley Mfg. Co., Chicago, Ill.

PUNCHES

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Interstate Machinery Co., Chicago, Ill.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Parker-Kalon Corp., New York, N. Y.
W. A. Whitney Mfg. Co., Rockford, Ill.

PUNCHES—COMBINATION BENCH AND HAND

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Parker-Kalon Corp., New York, N. Y.

PUNCHES—HAND

Niagara Mach. & Tool Wks., Buffalo, N. Y.
Parker-Kalon Corp., New York, N. Y.
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Independent Register & Mfg. Co., Cleveland, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

REGISTERS—WOOD

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White Mfg. Co., Minneapolis, Minn.

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Northwestern Stove Repair Co., Chicago, Ill.

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Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

ROOFING—IRON AND STEEL

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Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio
Inland Steel Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., The, Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

ROOFING—TIN AND TERNE

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

RUBBISH BURNERS

Hart & Cooley Mfg. Co., Chicago, Ill.

SCREWS—HARDENED METALLIC DRIVE

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Parker-Kalon Corp., New York

SCREWS—HARDENED SELF-TAPPING, SHEET METAL

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Parker-Kalon Corp., New York

SCREENS—PERFORATED METAL

Chicago Perforating Co., Chicago, Ill.
Harrington & King Perforating Co., Chicago, Ill.

SCUPPERS

Aeolus Dickinson, Chicago, Ill.

SHEARS—HAND AND POWER

Interstate Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Viking Shear Co., Erie, Pa.

SHEET METAL SCREWS—HARDENED, SELF-TAPPING

Parker-Kalon Corp., New York

SHEETS—ALLOY

Inland Steel Co., Chicago, Ill.
International Nickel Co., New York, N. Y.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

SHEETS—BLACK, CORRUGATED, GALVANIZED

American Rolling Mill Co., Middletown, Ohio
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

SHEETS—COPPER

American Brass Co., Waterbury, Conn.
Revere Copper & Brass, Inc., Rome, N. Y.

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American Rolling Mill Co., Middletown, Ohio
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

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Revere Copper & Brass, Inc., Rome, N. Y.

SHEETS—IRON

American Rolling Mill Co., Middletown, Ohio
Granite City Steel Co., Granite City, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

SHEETS—MONEL METAL

International Nickel Co., New York

SHEETS—NICKEL

International Nickel Co., New York

SHEETS—PURE IRON COPPER ALLOY

Newport Rolling Mill Co., Newport, Ky.

SHEETS—REFINED OPEN HEARTH IRON

American Rolling Mill Co., Middletown, Ohio

SHEETS—SPECIAL FINISH

American Rolling Mill Co., Middletown, Ohio
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Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio

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Globe Iron Roofing & Corrugated Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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SOLDER—ROSIN CORE

Kester Solder Co., Chicago, Ill.

SOLDER—SELF-FLUXING

Kester Solder Co., Chicago, Ill.

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Diener Mfg. Co., G. W., Chicago, Ill.

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Diener Mfg. Co., G. W., Chicago, Ill.

STARS—HARD IRON CLEANING

Fanner Mfg. Co., Cleveland, Ohio

STOVE PIPE AND FITTINGS

Meyer & Bro. Co., F., Peoria, Ill.
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David Levow, New York, N. Y.
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David Levow New York, N. Y.
Rival Strap Corp., New York, N. Y.

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Granite City Steel Co., Granite City, Ill.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.
Republic Steel Corp., Youngstown, Ohio

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(See Machines—Tinsmith's)

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Henry Furnace & Fdry. Co., Cleveland, Ohio
Health-Air Systems, Ann Arbor, Mich.
Hess Warming & Ventilating Co., Chicago, Ill.
Lennox Furnace Co., Marshalltown, Iowa
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Meyer Furnace Co., Peoria, Ill.
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(See Cleaners—Furnace Vacuum)

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Hart & Cooley Mfg. Co., Chicago, Ill.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Independent Reg. & Mfg. Co., Cleveland, Ohio

VENTILATORS—FLOOR

Aeolus Dickinson, Chicago, Ill.

VENTILATORS—ROOF

Aeolus Dickinson, Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Burt Mfg. Co., Akron, Ohio
Jordan & Co., Paul R., Indianapolis, Ind.
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

WATER PRESSURE REGULATORS

Apex Regulator Co., Marshalltown, Ia.

WOOD FACES—WARM AIR

Auer Register Co., Cleveland, Ohio
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

NEW PROFITS FOR FURNACE MEN NOW

ASK FOR COMPLETE INFORMATION ABOUT

NIAGARA

GAS AND COAL WARM AIR FURNACES

THE FOREST CITY FOUNDRIES COMPANY
Cleveland, Ohio

GLOBE BRAND TRADE MARK

METAL SHINGLES

Made of finest quality special soft Open Hearth Steel Plates, galvanized or painted. Three distinctive designs. Send for catalog.

The Globe Iron Roofing & Corrugating Co.
Cincinnati, Ohio

INCREASE YOUR PROFITS WITH THESE PRODUCTS

STANOCEL ASBESTOS PAPER

Asbestos Paper
8-10-12-14-16-32 lbs. per 100 square feet.
18" and 36" wide—50 or 100 lb. Rolls

STANDARD ASBESTOS MFG. CO. OF CHICAGO
820-822 W. LAKE ST.
BUY "ASBESTOS PAPER" MADE IN CHICAGO

Standard Corrugated Asbestos Paper
A flexible insulation ⅛, 1/6 or ¼ inch thick. Especially adapted for wrapping furnace pipes.

Standard Asbestos Mfg. Co. (Illinois)
2333 Pine St.
St. Louis

Standard Asbestos Mfg. Co. (Ohio)
5808 Euclid Ave.
Cleveland, O.

A UNIT THAT PRODUCES PROFITS

A-C Thermostatically Controlled Automatic HEAT BOOSTER

Write for full information and our catalog.

Then set out to develop this business in your territory.

A-C MANUFACTURING CO.
417 Sherman Ave., Pontiac, Ill.

RIVAL STRAP CORP. 308 WEST 20th ST. NEW YORK, N. Y.

THE "RIVAL" and "FITRITE"
One-Piece Ornamental Leader Straps
Patented July 10, 1928; Jan. 6th, 1931

Made in SIX STYLES

Straps Sold Through Jobbers Only

Write for folder showing complete line and sizes

"FITRITE"
Mop Heads & Staples
Malleable Iron

Write Dept. "A" for full details and prices

"FITRITE" SKYLIGHT GEARING

Iron or Bronze ⅜"-½" and 1" sizes.
Made also for chain operation

Patent Pending

"Fitrite" Adjustable PIPE SNOW GUARDS
Galvanized Iron or Bronze

"FITRITE" *Bronze* ROOF STRAINERS
3 Types. For Roofs having inside cast iron leader. Type "X" (illustrated), also made in Malleable Iron.

"FITRITE" *Bronze* BEEHIVE STRAINERS
For Round Leaders
3"-4"-5"-6"-7"-8" Diameter

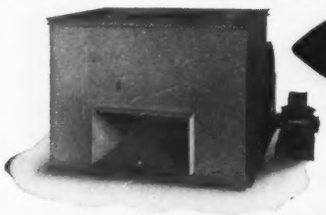
DAVID LEVOW 308 WEST 20TH ST. NEW YORK

THE VIKING SHEAR

Compound lever handle—removable blades. Upper blade away from mechanic enabling easy following of work—exclusive Viking feature.

Sold Under a Guarantee—Send for Particulars

VIKING SHEAR COMPANY, Erie, Pennsylvania



Blower

Air Conditioning

• **The Health Air Blower** **A Complete Air Conditioner** •
for New or Old Installations
Low Priced ***Write for our Attractive Proposition*** **Efficient**
HEALTH AIR SYSTEMS, 1105 N. Main St., Ann Arbor, Mich.

Air Conditioner

Have Your Trunk Ducts and Branches Designed by Overton for 40c Per Warm Air Grille!

Dealers can save from $50.00 to $100.00 on each job in material and labor alone, through using scientifically designed trunk lines and branches. The time saved in an attempt to balance a poorly designed system will more than pay for the cost of my engineering service.

NOTE THESE PRICES!

RESIDENCES

Up to and including 5 rooms	$1.10 per room
5 to 9 rooms inclusive	$1.00 per room
10 to 15 rooms inclusive	$0.85 per room
16 to 20 rooms inclusive	$0.80 per room
21 rooms and over	$0.75 per room

CHURCHES

Up to and including 50,000 cu. ft. gross content	$0.12 per 1,000 cu. ft.
50,000 cu. ft. and over	$0.10 per cu. ft.

SCHOOLS

20,000 to 50,000 cu. ft.	$0.30 per 1,000 cu ft.
50,000 to 70,000 cu. ft.	$0.25 per 1,000 cu. ft.
70,000 to 100,000 cu. ft.	$0.20 per 1,000 cu. ft.
100,000 cu. ft. and over	$0.15 per 1,000 cu. ft.

FACTORIES, GARAGES

Duct systems	$0.12 per 1,000 cu. ft. gross content
Unit heater systems	$0.10 per 1,000 cu. ft. gross content

Also Steam, Hot Water, Vapor Systems—1c per Square Foot of Radiation

SPECIAL NOTE

Where heating systems include filters, washers, temperature control as EXTRA EQUIPMENT—add 20 per cent to listed prices.

Where filters, washers, temperature controls are A PART OF THE HEATER AND ARE UNDER ONE CASING—listed prices apply.

For complete working plans detailing all trunk lines in ⅛-inch scale and showing details of elbows, stacks, branches, sections, cross sections of walls—add 50 per cent to list prices.

Add $0.01 per square foot of direct radiation for combination systems.

PLATTE OVERTON *Consulting Engineer* **2100 City Hall Square Bldg., Chicago**

CLASSIFIED ADVERTISING

BUSINESS CHANCES

LIGHTNING RODS

Dealers who are selling Lightning Protection will make money by writing to us for our latest Factory to Dealer Prices. We employ no salesmen and save you all overhead charges. Our Pure Copper Cable and Fixtures are endorsed by the National Board of Fire Underwriters and hundreds of dealers. Write today for samples and prices. Address L. K. Diddie Company, Marshfield, Wis.

SITUATIONS OPEN

ESTABLISHED MANUFACTURER OF steel furnaces is looking for a man to sell furnaces to dealers on straight commission basis in the State of Illinois. Positively no salary or drawing account, but liberal commissions. If you are a successful furnace salesman you can make more money on this proposition than on a salary. Address Key 100, "American Artisan," 1900 Prairie Avenue, Chicago.

FURNACE INSTALLERS

10 good mechanics soon, who are prepared to do a neat and fast job of furnace installation work. Steady time at least ten months with part time other two. State rate expected and experience. Address Mr. Harmon, 400 N. Midler Ave., Syracuse, N. Y.

WANTED—ROOFING AND SHEET metal estimator and salesman; someone thoroughly experienced in the industry. Address Key 110, "American Artisan," 1900 Prairie Avenue, Chicago.

WANTED

Experienced furnace salesman for Missouri, Kansas, Nebraska and Colorado territories. Well known line. Commission basis. Address Key L-546, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATIONS WANTED

POSITION WANTED BY WELL EXPErienced hardware salesman in store. Excellent references. Also, can put on sale to your advantage. Address Key 117, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY FIRST-CLASS sheet metal, plumbing and heating man. Sixteen years' experience. Will go any place. A-1 references. Married. Address Key 108, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY A-1 MEchanic, sheet metal, furnace and plumbing. Can lay out jobs and sell. Now open for good job. Can come after March 15. Address Key 103, "American Artisan," 1900 Prairie Avenue, Chicago.

POSITION WANTED—BY FIRST-CLASS sheet metal worker and furnace man. Will go anywhere, but prefer small town or country shop. Address Key 102, "American Artisan," 1900 Prairie Avenue, Chicago.

HEATING ENGINEER, WITH SALES promotion experience, would be willing to work with several dealers in same general locality. Organize and train your sales force both in sales and engineering. References exchanged. For particulars write Key 109, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY MIDDLE aged combination man, expert on heating. Can do a good job of plumbing or sheet metal work. Good salesman. Hardware experience. References. Address Key 105, "American Artican," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—MAN WITH real record of sales promotion in retail field and experienced air conditioning engineer is open for connection with manufacturer or large retail organization. Best of references. Address Key 116, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—A-1 SHEET metal worker, plumber and heating man with 25 years' experience at the trade. Strictly sober and reliable. Would like a good steady position. Would prefer Southern Wisconsin or Northern Illinois but will go anywhere. Address Key 119, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—A FIRST-CLASS A-1 mechanic with more than twenty years' experience in all lines of sheet metal work, wishes to hear from someone who needs a first-class man. Can give best of references and go anywhere. Address Mechanic George, 154 Oakland Avenue, Macon, Georgia.

SITUATION WANTED—BY SHEET metal worker. Nineteen years' experience in general sheet metal and latest warm air heating work. Can make plans, patterns, and put up work in first class finished manner. Would like to get with some firm who would at some time sell part or all. Prefer Illinois union shop. Address Key O-546, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY A-1 SHEET metal worker. Can do all kinds of sheet metal work, including cornice and skylight making. Have also had quite a bit of experience in roofing. Am under 30 years of age and am married. Will go anywhere and stay as long as work is steady. Address Key G-546, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY FIRST-CLASS tinner and hardware man, 19 years' experience, making specialty of warm air heating. Have complete knowledge of layout, estimating, sales. Can do plumbing, steam and hot water heating, installing of oil burners. Experienced in electric wiring and radio repairing. Good fast worker. Steady, reliable, married, 39 years old. Good references from past employers. Address Key E-546, "American Artisan," 1900 Prairie Avenue, Chicago.

POSITION WANTED—AN EXPErienced heating man. Thirty-eight years of age. College education. Married. Seeks opportunity where compensation depends on ability and success. Fully versed in gravity, forced air, conditioned air, as well as gas installations. Capable of own layout work. With present firm seven years. Have following in my state. Honest; a hard worker who can produce. A-1 references as well as successful record of accomplishments. Address Key 107, "American Artisan," 1900 Prairie Avenue, Chicago.

WANTED TO BUY

WANTED—SMALL HARDWARE STOCK with sheet metal shop in connection in good town in south or southwest, of about 3 to 5 thousand population. Would consider shop only. Address all communications to Box 174, Williamsburg, Iowa.

WANTED—TO BUY, OR OPERATE ON shares, well established warm air heating and general sheet metal shop in fair sized city, by middle aged man and sons, who have had wide experience in all branches of the trade. At present am foreman in heating, ventilating and air conditioning shop. Give full information. Address Key J-546, "American Artisan," 1900 Prairie Avenue, Chicago.

SHOP WANTED—ON COMMISSION BAsis by licensed master plumber with full set of tools and small amount of money to invest. Can also do steam, vapor, hot water and hot air furnace work. Can read plans and estimate all the above work. Best of references as to ability, honesty, etc. Illinois preferred. Address Key R-546, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE

WANTED TO TRADE, OR, SELL, ONE Eureka lawn mower grinding machine. Would consider a 4, 6 or 8 foot Brake or Key Machine in exchange or buy same. Address F. F. Chapman, Worthington, Indiana.

FOR SALE—METAL CEILING MANUfacturing equipment and dies, one of the best lines manufactured in the country. Will sell reasonable. Address Key 113, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—AN OLD AND WELL ESstablished furnace and sheet metal shop, located in a town of 11,000; very little competition. Can step right in and go to work. Will sacrifice for $2500. Full particulars on request. Address Key 104, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—WELL ESTABLISHED sheet metal shop in central Illinois town of 3,500, also fully equipped for radiator repairing. Would consider terms with substantial down payment and good collateral. This is no sacrifice, as it is a going business and unless you have money and are really interested do not reply. Address Key 118, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—TWO MODEL "J" WILliams Oil-O-Matic oil burners. One used only 30 days. One used about two years. Both are as good as new. Complete with controls. Best offer gets them both. Address Key 106, "American Artisan," 1900 Prairie Ave., Chicago.

FOR SALE—1 NO. 2 RYERSON SERpentine Shear Motor Drive for $200, 1 Niagara Small Turning Machine, including No. 11 Elbow Edging Rolls (New) $15; 1 Niagara Setting Down Machine $5; 1 Pexto Double Seaming Machine (1 10-inch Disc) $5; 1 Dreis & Krump Angle Iron Cutter $5; 1 Mighty Midget Unishear (Brand New) $40; 1 Old Bench Shear $2. Address Jos. Koubek & Son, 5234 West 22nd Street, Cicero, Illinois.

FOR SALE—ONE LOT OF SHEET metal working machines, including 8-foot Wooden Truss Brake, 30-inch and 36-inch Square Shears, Marshalltown Throatless Shear, 16-gauge hand power, Cross Lock Machine, twelve various type Burring Machines and 2 sets of 30-inch forming rolls. Above tools acquired in purchase of other shops and will dispose of them at sacrifice for quick sale. Wonderful opportunity for some sheet metal worker just starting up in the business. Smith & Burrows Company, Parkersburg, West Va.

LINES WANTED

EXPERIENCED SALESMAN CALLING on furnace trade in Iowa can handle one or two good lines to advantage. Commission basis. Address Key 111, "American Artisan," 1900 Prairie Avenue, Chicago.

LINES TO HANDLE

MANUFACTURER WITH COMPLETE line of Furnaces, Boilers, Radiation and Water Heaters has few open territories in Central West. Excellent earnings for producers. Address Key 115, "American Artisan," 1900 Prairie Avenue, Chicago.

MISCELLANEOUS

PHILIP V. W. PECK

Patent and Trade Mark Law

Barrister Bldg., Washington, D. C.

AIR CONDITIONING SYSTEM FOR RESidential application. Takes care of heating, cooling, humidifying, dehumidifying and filtering. Owner and inventor wishes to get in touch with a manufacturer with sufficient finance and manufacturing facilities to make and market this system. Address Key 114, "American Artisan," 1900 Prairie Avenue, Chicago.

Index to Advertisers

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in alternate issues is marked with an asterisk.

March 28, 1932

How He Sold TONS of REPAIR PARTS and TWELVE HEATING PLANTS

1932 Model, ½ H.P. plus, has 60% higher suction; safety trap which protects the fan from heavy objects drawn in; new style big bag; extra "suit case" bag, clean, for upstairs; plus other features.

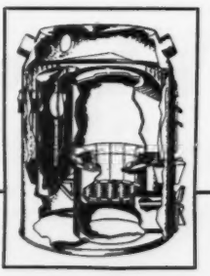
H. A. Harmening, of Terre Haute, sold a $196 replacement, on his very first cleaning job.

His first one hundred cleanings sold a dozen new plants, and several tons of repair parts.

Would you like to see the Plan Book which he used? It is free, and shows how he got his sales. And do you know how you can first try the good Super Suction before you decide to keep it? And then let it pay for itself? Easy.

Send this clipping, with your name and address on it, to

The NATIONAL SUPER SERVICE Co.
1944 NORTH 13th STREET TOLEDO, OHIO



Mr. Master is Going to Buy a Warm Air Furnace

Will you sell him an

X-L-ALL

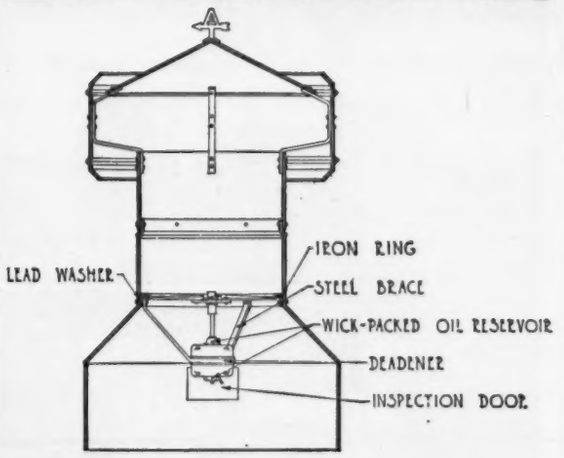
(Patent Applied For)

or let your competitor make a sweet profit? Master knows little about furnaces but it won't take him long to appreciate the economic advantages of the oversize combustion chamber and increased direct heating surface. He, like thousands of others, knows that the X-L-ALL represents the only outstanding improvement in steel furnaces in 20 years. It stands in a class by itself, as you'll readily agree, after reading our most interesting booklet which will be sent without further obligation on your part. Write for yours today.

THE DESHLER FOUNDRY & MACHINE WORKS
140-142 South East Ave., Deshler, Ohio

JORDAN AERO VENTILATION

F-DIRECT CONNECTED-AN VENTILATOR



A Unit for greater efficiency.
Combining gravity, ventilator and fan action.
Eliminating wind and weather hazard.

Backed by a complete engineering service

PAUL R. JORDAN & CO.
630 South Delaware St. Indianapolis, Ind.

MARSHALLTOWN THE MARSHALLTOWN LINE **SHEARS**

No. 18

SHEARS THAT CUT

That's what you're looking for—shears that will save money for you—shears that stand the gaff.

Install at least one type of Marshalltown throatless shears in your shop. Do it now!

SHEARS FOR EVERY JOB: CUTTING CAPACITY UP TO ½".

TheMARSHALLTOWN line is complete—a shear for every use.

THE CATALOGUE TELLS THE STORY—WRITE FOR IT

SPECIFICATIONS

CAPACITY—
18 gauge and lighter — 1¾" radius.

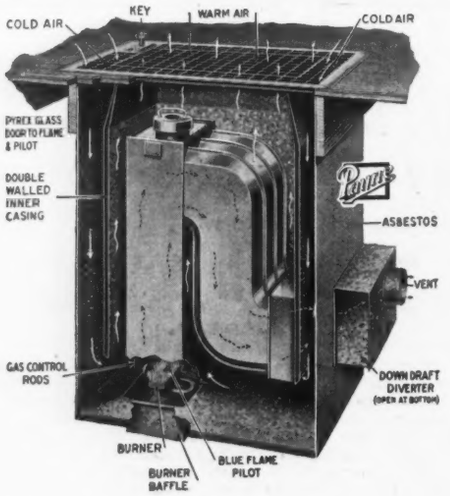
CUTTERS—
2"x1⅞"—high grade tool steel. Slightly knurled to feed material.

ADJUSTMENT—
One bolt. Instructions furnished.

SIZE AND MATERIAL—
Height 19½"; head cast iron; base cast iron; gears steel and cast iron. Shipping weight 45 lbs.

MARSHALLTOWN MFG. CO. MARSHALLTOWN IOWA

PAYNE
Floor Furnaces



Winter's Substitute for Summer's HEAT!

THE PAYNE FLOOR Furnace uses gas—the cleanest, most dependable and most efficient of all fuels. Gives ideal summer heat indoors. Endorsed by thousands of users everywhere!

NO MORE COLD FLOORS

No Sweating of Windows

THE PAYNE Floor Furnace circulates fresh pure warm air in every nook and corner, keeps floors warm! Free from smoke, fumes and vapors!

WARM AIR HEATING Without a BASEMENT

PAYNE FLOOR FURNACES have been tested and proved in the crucible of time. Durably constructed. Easy to install and operate. Completely welded heating element. Heating efficiency, burner operation, safety, construction and performance have been approved by the American Gas Association—and by thousands of happy and enthusiastic users.

Every PAYNE FLOOR FURNACE installation is a friend-maker and a sure "repeater". No forced selling to put this item over. A sales success for sixteen years.

Write Today for Details of Dealer Franchise!

Payne

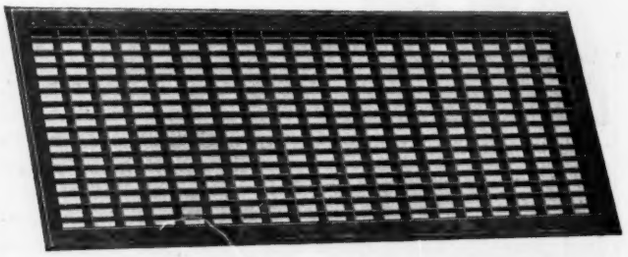
PAYNE FURNACE & SUPPLY CO.
Beverly Hills • California

There is a Payne Heat System for Every Building and Climate!

Announcing

The New H & C "NO-FLEX" COLD AIR FACE

Class 265



Furnished in Two Shades of Oak

Our former medium shade (now known as No. 1 Oak) and a new darker shade, known as No. 2 Medium Dark Oak. Both finishes are also available on our entire line, including No. 200 Floor Registers and No. 255 Cold Air Faces. All orders should specify which shade is wanted. The new No. 2 Oak will be considered standard on the "No-Flex" line.

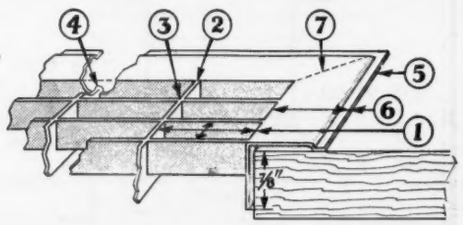
Incorporates

7 DEFINITE SUPERIORITIES

1. Mesh is narrow, ¾" x 1½", reducing possibility of "heel trouble" to a minimum.
2. All Grid cross-members have squared upper edges resulting in improved walking surface, and showing finish to full advantage.
3. Intersections are perfectly flush (impossible with round-edge stock). This construction produces a neater effect and reduces possibility of heels slipping into the mesh.
4. Grid cross-members, PERFECTLY ALIGNED, are welded to outer frame at regular intervals, locking the entire assembly rigidly together.
5. Margins (straight as a die) are uniform and true, and are beveled to provide stiffness, neat appearance, and to compensate for unevenness in floor.
6. Narrow margin permits installation close to baseboard.
7. Corner joints are welded on the underside, and are *invisible* on the surface.

Ready for Immediate Delivery in all Popular Sizes

A Descriptive Circular Will be Mailed Soon. Watch for It.

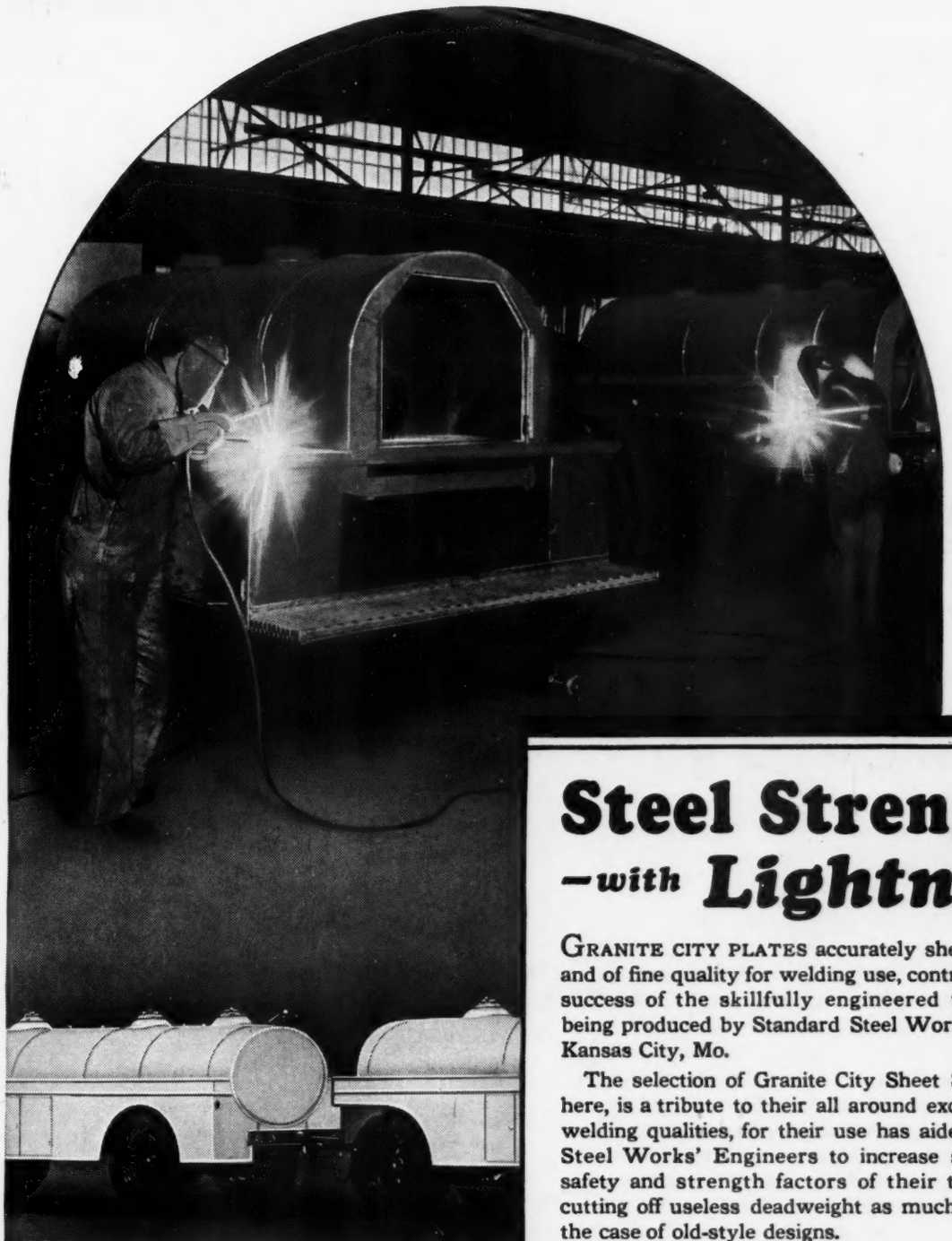


WROUGHT STEEL H&C WARM AIR REGISTERS

HART & COOLEY MFG. CO.

CHICAGO, 61 West Kinzie Street PHILADELPHIA, 1600 Arch Street
New Britain, Conn., Corbin Ave. New York, 101 Park Ave.
Boston, 75 Portland Street Wm. Highton & Sons Division, Nashua, N. H.
***Factories at* Holland, Mich.—New Britain, Conn.—Nashua, N. H.**

Registers for all purposes. Also a complete line of perforated and cast ornamental grilles, furnace regulators, dampers, pulleys, chain, and the H & C Automatic Heat Control.



COURTESY STANDARD STEEL WORKS

Steel Strength —with *Lightness*

GRANITE CITY PLATES accurately sheared, clean, and of fine quality for welding use, contribute to the success of the skillfully engineered truck tanks being produced by Standard Steel Works of North Kansas City, Mo.

The selection of Granite City Sheet Steel Plates here, is a tribute to their all around excellence and welding qualities, for their use has aided Standard Steel Works' Engineers to increase steadily the safety and strength factors of their tanks while cutting off useless deadweight as much as 50% in the case of old-style designs.

And Granite City Steel service matches Granite City Steel quality. 29 railroads and the Mississippi River expedite delivery from Granite City, Illinois to the Mississippi Valley, the West and the Southwest.

Chicago, Dallas
Kansas City
Los Angeles

SINCE
REG. U.S. PAT. OFF.
GRANITE CITY STEEL
1878

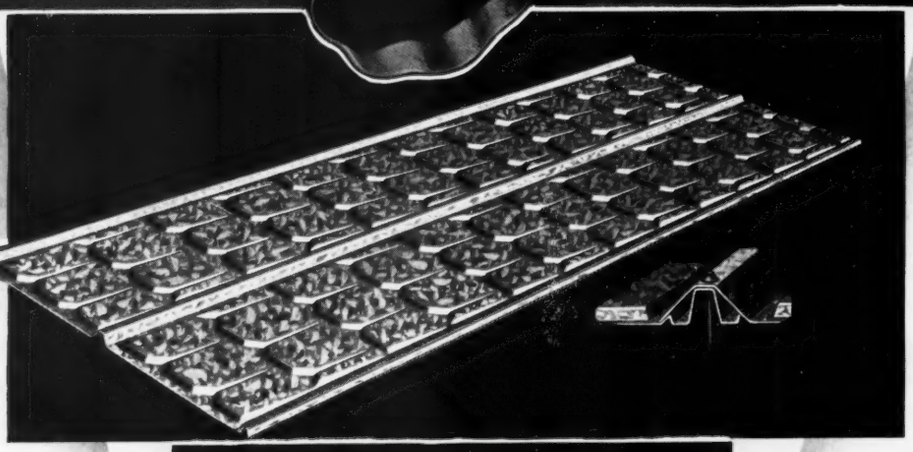
St. Louis, St. Paul
San Francisco
Salt Lake City

GALVANIZED SHEETS
STEEL SHEETS
PLATES AND
TIN PLATE

•

GRANITE CITY STEEL CO

GRANITE CITY, ILLINOIS



Architectural Ornaments

Metal Ceilings

Ventilators and Skylights

Stove Pipe and Elbows

Furnace Pipe and Fittings

Rain Carrying Equipment

Roofing and Roof Trimmings

Spanish and American Tile

Twodrain Channel Roofing

Sheets and Siding

Milcor Products are the Raw Material of Your Success

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